

COMISION NACIONAL DE ENERGIA ATOMICA

DIRECCION INVESTIGACION Y DESARROLLO

GERENCIA DESARROLLO

Departamento Química

DATOS FISICOQUIMICOS DEL H_2S ? $H_2^{34}S$ Y SUS COMPUESTOS DEUTERADOS.

M.A. Molinari, J. Botbol, A.M.G. La Gamma de Patistoni y
R. Aprile.

INTRODUCCION

Como etapa previa a todo desarrollo de planta piloto o de producción industrial es necesario realizar estudios básicos sobre los métodos correspondientes y reunir toda la información experimental y teórica disponible.

En el caso particular de la obtención de agua pesada se decidió comenzar ese trabajo preliminar en lo referente a uno de los métodos de fabricación industrial de mayor importancia, como es el de intercambio isotópico sulfuro de hidrógeno/agua, conocido como "proceso G.S.".

En un primer estudio bibliográfico se constató la abundancia de información sobre los compuestos involucrados en dicho proceso, así como sobre los sistemas fisicoquímicos formados por los mismos. Esto estableció la posibilidad de que muchos de los datos que deberían obtenerse en investigaciones de laboratorio o estudios teóricos previos a la etapa de planta piloto, ya estuviesen publicados.

Por otra parte, las fuentes de información, además de numerosas, son muy variadas, de diversa índole y en algunos casos se superponen parcialmente, de manera que es difícil en su forma original su evaluación y aplicación y no es posible detectar fácilmente deficiencias de datos en algún área de interés.

Es por ello que se consideró necesario la reunión en un solo volumen de todo el material disponible en estos momentos, convenientemente seleccionado, revisado y ordenado.

Se intenta de esta manera proveer la base de datos indispensables para encarar futuras etapas de desarrollo, primeramente en escala de laboratorio, detectando puntos particulares en que se requiera, posteriormente de planta piloto y finalmente de producción industrial. Se supone que este volumen será de utilidad tanto dentro de la C.N.E.A., como en otras Instituciones u Organismos que puedan colaborar en nuestros planes de provisión de agua pesada para el programa nuclear argentino.

En general se ha incluido todos los datos disponibles que se consideraron de eventual interés. En el caso de agua ordinaria (H_2O) y a veces del SH_2 , teniendo en cuenta el grán número de datos existentes, se incluyen sola-

mente los ámbitos de temperatura, presión, etc., compatibles con el citado método industrial de producción de agua pesada.

Cuando existía más de una fuente de información se consignó todas las de origen independiente, ya que está fuera de la índole de este trabajo hacer una selección y se consigue así dar una idea del error de los datos. Tampoco se hizo transcripción de sistemas de unidades, respetándose el usado por los autores originales y citándose un mismo dato en distintas unidades si así se encontraba en la bibliografía. Se agregaron además propiedades de interés analítico, como ser parámetros ópticos, por estar relacionadas con el control del proceso.

La ordenación se efectuó dividiendo en 2 secciones (agua y sulfuro de hidrógeno) en cada una de las cuales se ordenó alfabéticamente. Los datos referentes a sistemas formados por ambos compuestos (por ejemplo solubilidad, constantes de equilibrio, etc.) se incluyeron en la sección del sulfuro de hidrógeno. El índice se confeccionó reuniendo en orden alfabético ambas secciones.

El origen de los datos se indicó mediante un número que identifica la fuente bibliográfica, seguido del número de página correspondiente, ubicados en el ángulo inferior izquierdo de cada tabla ó gráfico.

Por último, aún siendo nuestra intención realizar una recopilación de carácter completo a la fecha, es necesario reconocer que ningún trabajo de esta índole puede considerarse final y exhaustivo. Creemos por lo tanto que este será el Volumen I de una publicación que se completará en el futuro con suplementos de acuerdo a la disponibilidad y requerimientos de nueva información.

DATOS FISICOQUIMICOS DEL H_2O
Y SUS COMPUESTOS DEUTERADOS.

PROPIEDADES FISICAS DEL AGUA LIVIANA Y PESADA

Propiedad	Unidad	H ₂ O	D ₂ O
Peso molecular	¹² C escala	18.015	20.028
Punto de fusión	°C	0.00	3.81
Temperatura del punto triple	°C	0.010	3.82
Temperatura de máxima densidad	°C	3.98	11.23
Punto de ebullición	°C	100.00	101.42
Máxima densidad	g cm ⁻³	1.0000	1.1059
Densidad a 25°C	g cm ⁻³	0.99701	1.1044
ΔH fusión al P.F.	Kcal mol ⁻¹	1.436	1.515
ΔS fusión al P.F.	u.e.	5.26	5.42
ΔH°vapor a 25°C	Kcal mol ⁻¹	10.52	10.85
ΔG°vapor a 25°C	Kcal mol ⁻¹	2.06	2.14
ΔS°vapor a 25°C	u.e.	28.39	29.22
ΔH°f del líquido a 25°C	Kcal mol ⁻¹	-68.32	-70.41
ΔG°f del líquido a 25°C	Kcal mol	-56.69	-58.20
S° del líquido a 25°C	u.e.	16.75	18.19
ΔH°f del gas a 25°C	Kcal mol ⁻¹	-57.80	-59.56
ΔG°f del gas a 25°C	Kcal mol ⁻¹	-54.64	-56.06
S° del gas a 25°C	u.e.	45.14	47.41
Coeficiente de expansión térmica:			
Sólido al P.F.	°C ⁻¹	1.39.10 ⁻⁴	1.39.10 ⁻⁴
Líquido al P.F.	°C ⁻¹	-5.9 .10 ⁻⁵	-3.2 .10 ⁻⁵
Líquido a 25°C	°C ⁻¹	26.2 .10 ⁻⁵	21.8 .10 ⁻⁵
Presión de vapor del líq. a 25°C	mm Hg	23.75	20.51
Constante dieléctrica a 25°C	Debyes	78.39	78.06
Tensión superficial a 24°C	dina cm ⁻¹	71.97	71.93
Viscosidad a 25°C	cpoises	0.8903	1.107
Vibraciones fundamentales	cm ⁻¹	3657.05	2671.69
	cm ⁻¹	1594.59	1178.33
	cm ⁻¹	3755.79	2788.02
Constante de ionización a 25°C		1.10 ⁻¹⁴	1.95.10 ⁻¹⁵
Calor de ionización a 25°C	Kcal mol ⁻¹	13.45	14.42

SOLUBILIDADES DE ALGUNAS SALES EN D₂O Y H₂O A 25° C

Sal	Solubilidad ^a		$\frac{x_{H_2O}}{x_{D_2O}}$
	x_{D_2O}	x_{H_2O}	
NaCl	5.76	6.145	1.060
KCl	4.38	4.80	1.088
KBr	5.10	5.71	1.109
KI	8.07	8.90	1.088
KMnO ₄	0.379	0.483	1.272
TlNO ₃	0.347	0.440	1.264
TlClO ₄	0.415	0.511	1.229
AgClO ₃	0.751	0.890	1.182
LiCl-1aq	20.28	19.90	0.986
LiF			0.870
SrCl ₂	3.54	3.50	0.989
PbCl ₂	0.0249	0.0391	1.570
CuSO ₄	1.29	1.39	1.075
CuSO ₄ -5aq	1.368	1.443	1.054

^a Las solubilidades están expresadas en unidades de acuumolali
dad. Ej: moles de sal por 55,51 moles de solvente.

1-p.113

PROPIEDADES DEL AGUA

Propiedad	H ₂ O	D ₂ O
Densidad máxima	1.00000	1.10596
Temperatura de máxima densidad	3.98°C	11.23°C
Punto de fusión	0.00°C	3.813°C
Punto de ebullición	100.00°C	101,431°C
Temperatura Crítica:	374.2°C	371.5°C
Presión	218.53 Atm	218.6 Atm
Densidad	0.325 g/ml	0.363 g/ml
Calor de vaporización, cal/mol	10515	10846
Calor de fusión, cal/mol	1436	1515
Capacidad calorífica, Cp, cal/mol/°C	18.0	20.1
Calor de formación, (25°C), cal/mol	68318	70414
Indice de refracción (20°C)	1.33300	1.32828
Tensión superficial (25°C), dinas/cm	71.97	71.93
Viscosidad, centipoises, (20°C)	1.00	1.25

2-p.10

PROPIEDADES QUIMICAS MOLECULARES DEL H_2O Y D_2O

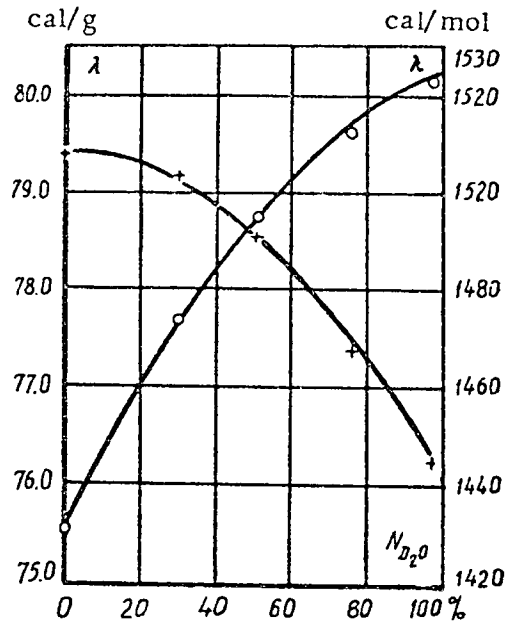
Propiedad	H_2O	D_2O
Constante de Ionización (25°C)	1×10^{-14}	1.95×10^{-15}
Valores de pH (pD) para:		
Actividad 1,0 Molal H^+ (D^+)	0	0
Neutralidad	7.0	7.36
Actividad 1,0 Molal OH^- (OD^-)	14.0	14.72
pK_a para varios ácidos:		
Acético	4.74	5.26
Fosfórico (primera disociación)	7.19	7.75
Cloroacético	2.76	3.20

2-p.11

CALOR LATENTE DE FUSION DE SOLUCIONES $\text{D}_2\text{O}-\text{H}_2\text{O}$

Densidad g/cm^3	Contenido del D_2O , mol%	Tiempo de fus. del hielo, min.	Calor lat. de fusión cal/g, ded. del peso		P.F., °C	Pto. de fu- sión según La Mer y Baker.
			Al princi- pio de la experienc.	Al final de la expe- riencia.		
0.9980 (21° C)	—	94	79.32	79.45	—	—
0.9980 (21° C)	—	80	79.38	79.51	—	—
1.0304 (18° C)	29.67 ± 0.05	94	79.09	79.16	1.45	—
1.0304 (18° C)	29.67 ± 0.05	104	79.29	79.33	1.35	—
1.0304 (18° C)	29.67 ± 0.05	90	79.10	79.14	1.40	1.20
1.0529 (16.6° C)	50.51 ± 0.05	90	78.54	78.66	2.05	—
1.0529 (16.6° C)	50.5 ± 0.05	78	78.46	78.58	2.15	2.00
1.0800 (21° C)	76.36 ± 0.05	90	77.20	77.34	3.05	—
1.0800 (21° C)	76.36 ± 0.05	96	77.42	77.57	3.00	3.00
1.1036 (18.5° C)	97.70 ± 0.05	80	76.12	76.17	3.75	—
1.1036 (18.5° C)	97.70 ± 0.05	90	76.11	76.16	3.80	—
1.1036 (18.5° C)	97.70 ± 0.05	—	76.44	76.49	3.70	3.75
	100.00		Por extrapolación $\lambda = 76,15 \text{ cal/g}$			

15-p. 104



Calor latente de fusión de mezclas D_2O-H_2O .

15-p.105

CALOR DE FUSION DEL D_2O

Rango de temperatura	Calor total	corrección cal/mol	Calor de fusión
247.07-288.43	1872.7	373.5	1499.2
273.84-285.43	1796.4	293.5	1502.9
274.97-287.06	1818.3	317.8	1500.5

15-p.106

Promedio: $1,501 \pm 3$

CALOR DE FUSION DEL D_2O

Autores	Calor de Fusión cal/mol	Método	Año
La Mer y Baker	1510	1	1934
Jacobs	1525 $\pm$ 2	2	1935
Brown, Barness y Maass	1486 $\pm$ 4	3	1935
Bartholome y Clusius	1522 $\pm$ 8	4	1935
Bridgman	1523	5	1935
Long y Kemp	1501 $\pm$ 3	6	1936
Redlich y Zentner	1508 $\pm$ 2	7	1936
Niwa y Shimazaki	1489 $\pm$ 93	8	1936

- 1.- Depresión del punto de congelación.
- 2.- Calorímetro eléctrico.
- 3.- Método calorimétrico indirecto.
- 4.- Calorímetro de hielo.
- 5.- Dependencia del punto de fusión sobre la presión.
- 6.- Calorímetro.
- 7.- Calorímetro eléctrico.
- 8.- Presión de vapor.

15-p.106

CALOR DE MEZCLA DE AGUA LIVIANA Y PESADA.

Calor de mezcla para una mezcla equimolecular:

$q = 7,92 \pm 0,25$ cal/mol. en fase líquida (valor experimental):

de donde se deduce que el calor de formación de HDO a partir de $H_2O + D_2O$:

$q' = 16,7 \pm 0,5$ cal/mol. en fase líquida.

En fase gaseosa:

$q' = 34$ cal/mol. (valor calculado a partir de la constante de equilibrio de la reacción)

13-p.72

DATOS EXPERIMENTALES DE CALOR ESPECIFICO PARA D₂O PURA

T°K	c _G .cal/°	$\mu c_p^{D_2O}$ cal/mol.°
293	51.46	20.20 ₅
303	52.37	20.11 ₇
313	53.01	20.04 ₆
323	53.65	19.99 ₄
333	54.18	19.95 ₆
343	54.98	19.89 ₇
353	55.87	19.84 ₆
363	56.76	19.79 ₉
373	57.39	19.78 ₈
383	57.84	19.80 ₀
393	58.25	19.80 ₈
398	58.60	19.83 ₀

13-p.46

CALOR ESPECIFICO A VOLUMEN CONSTANTE C_v

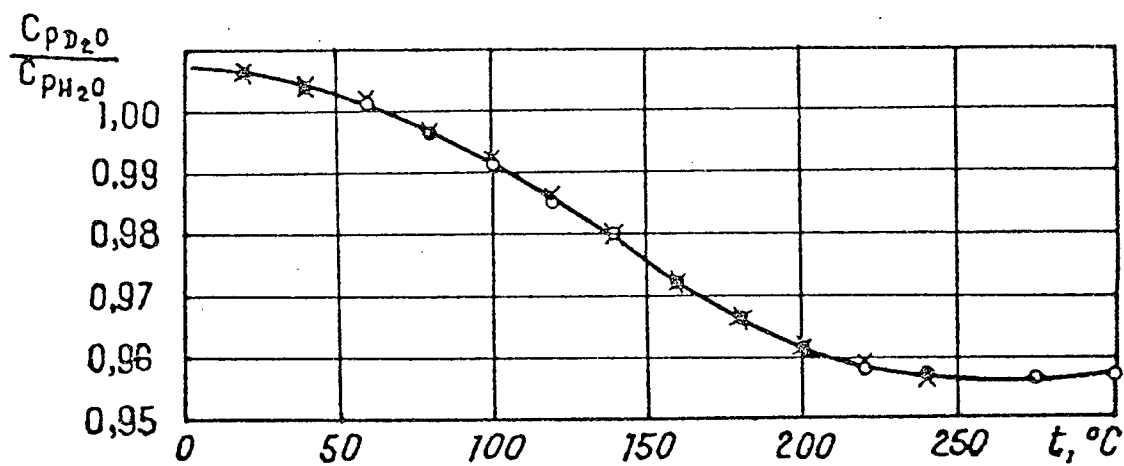
T (°K)	C _v cal./mol/°
283	20,30
303	19,9
323	19,4
343	18,8
363	18,2
383	17,7

13-p.46

CALOR ESPECIFICO DEL D₂O

T (°C)	$\frac{C_p (D_2O)}{C_p (H_2O)}$	$C_p (D_2O)$ 50 Kg / cm ²	$C_p (D_2O)$ 100 Kg/cm ²
20	1,006	1,002	1,000
40	1,004	0,998	0,996
60	1,002	0,996	0,993
80	0,997	0,996	0,995
100	0,992	0,995	0,992
120	0,986	0,996	0,992
140	0,980	0,998	0,994
160	0,972	1,004	1,000
180	0,966	1,014	1,008
200	0,962	1,030	1,023
220	0,958	1,051	1,043
240	0,957	1,083	1,073
260	0,957	1,130	1,116
280	0,957	-	1,178
300	0,958	-	1,294

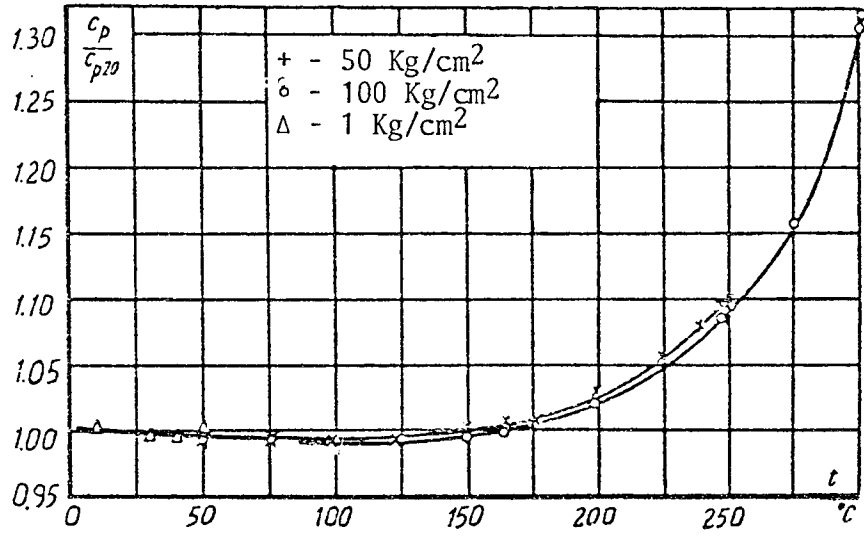
13-p.47

Calor específico del D₂O.

13-p.47

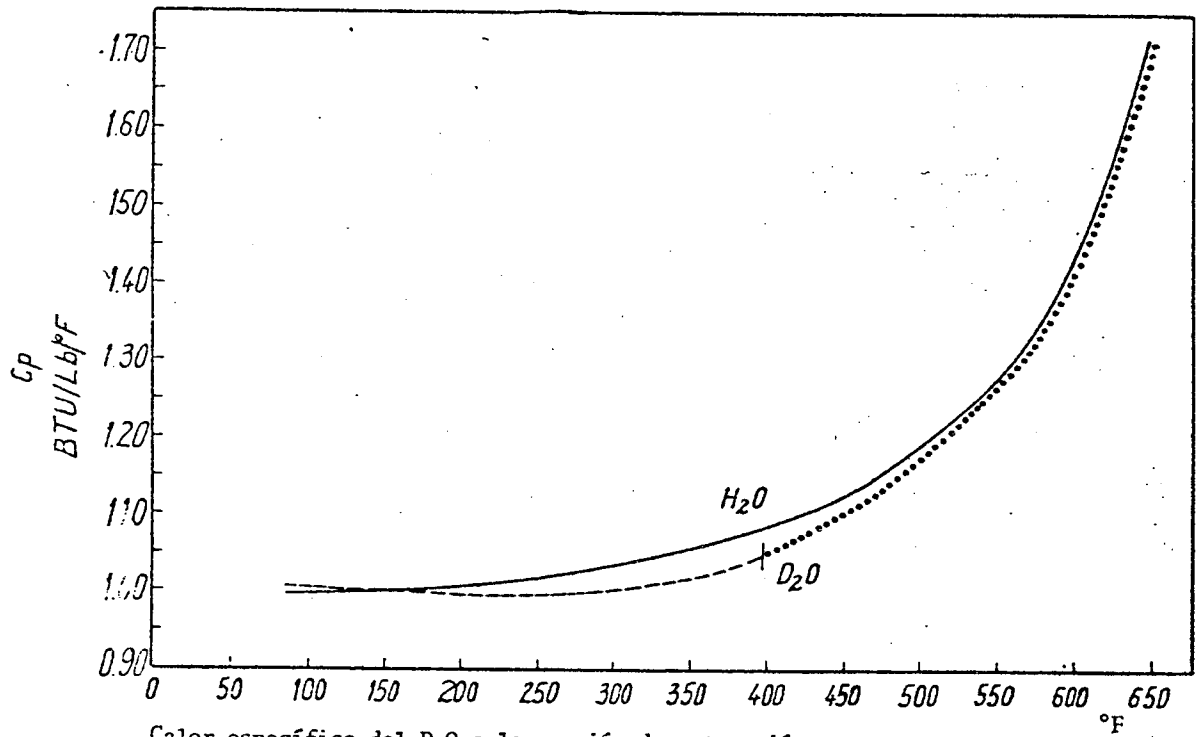
CALOR ESPECIFICO DEL D₂O A LA PRESION
DE SATURACION (B.T.U./lb./° F.)

T (° C)	Valores calculados
395	1,046
400	1,050
410	1,059
420	1,070
430	1,080
440	1,092
450	1,104
460	1,118
470	1,130
480	1,144
490	1,159
500	1,175
510	1,190
520	1,209
530	1,228
540	1,249
550	1,270
560	1,292
570	1,318
580	1,346
590	1,38
600	1,42
610	1,47
620	1,53
630	1,59
640	1,65
650	1,72
660	1,80
670	1,88



Calor específico del D_2O .

15-p.86



Calor específico del D_2O a la presión de saturación.

13-p.49

CALOR ESPECIFICO DEL D₂O A LA PRESION DE SATURACION (B.T.U/lb/° F)

T (° F)	Valores experimentales	Valores más probables
87,58	1,0143	1,0048
89,26	0,9970	1,0047
89,65	1,0078	1,0046
90,55	0,9984	1,0046
92,14	1,0035	1,0044
95,11	1,0096	1,0041
95,81	0,9998	1,0040
97,54	1,0088	1,0039
99,10	0,9922	1,0037
104,50	0,9985	1,0031
104,54	1,0113	1,0031
104,68	1,0092	1,0031
105,08	1,0148	1,0031
106,34	1,0125	1,0030
107,10	0,9997	1,0029
113,94	0,9880	1,0021
115,75	1,0005	1,0019
120,67	0,9903	1,0013
122,16	0,9988	1,0012
139,39	0,9887	0,9992
156,60	1,0075	0,9973
158,29	1,0086	0,9971
160,14	1,0068	0,9969
173,62	0,9813	0,9955
175,68	0,9867	0,9953
177,48	0,9972	0,9952
176,00	0,9975	0,9953
194,00	0,9936	0,9938
212,00	0,9914	0,9928
230,00	0,9939	0,9924
248,00	0,9939	0,9928
266,00	0,9958	0,9940
284,00	0,9986	0,9963
302,00	1,0020	0,9998
320,00	1,0053	1,0045
338,00	1,0045	1,0107
356,00	1,0151	1,0184
374,00	1,0279	1,0279
392,00	1,0427	1,0392

* Valores extrapolados.

COMPARACION DE VALORES OBSERVADOS Y CALCULADOS DE LOS
CALORES ESPECIFICOS DEL D₂O Y H₂O

$$\Delta C_p = [C_p (D_2O) - C_p (H_2O)]$$

T (°K)	$\frac{\Delta C_p \text{ (calc.)}}{3 R}$	$\frac{\Delta C_p \text{ (Exp.)}}{3 R}$
20	0,003	0,007
30	0,010	0,010
40	0,020	0,010
50	0,027	0,014
60	0,033	0,017
80	0,037	0,027
100	0,054	0,042
120	0,082	0,084
160	0,160	0,160
200	0,220	0,219
240	0,255	0,250
270	0,262	0,266

13-p.50

CALOR ESPECIFICO C_p DEL H₂O Y D₂O Y SOLUCIONES DE AGUA SOLIDA EN EL PUNTO DE FUSION

Conc. del D ₂ O %	29.67 ± 0.5			50.51 ± 0.5		76.36 ± 0.5		97.70 ± 0.5		
Dens. del H ₂ O g/cm ³	1.0304 (18°C)			1.0529 (16.6°C)		1.0800 (21°C)		1.1036 (18.5°C)		
P. F., °C	1.45	1.35	1.40	2.05	2.15	3.05	3.00	3.75	3.80	3.70
Calor esp. C _p del hielo Kcal/Kg ²	0.41	0.47	0.41	0.54	0.51	0.54	0.54	0.50	0.53	0.49
Calor esp. C _p del liq. Kcal/Kg ²	1.06	1.07	1.08	1.08	1.06	1.05	1.06	1.06	1.06	1.07

15-p.73

CALOR ESPECIFICO DEL D₂O SOLIDA

t, °C	c _p , Kcal/kg. °	
	D ₂ O	H ₂ O
0	0.579	0.4873
- 10	0.545	0.4770
- 20	0.514	0.4647
- 30	0.484	0.4504
- 40	0.457	0.4340
- 50	0.432	0.4160
- 60	0.410	0.3958
- 70	0.391	0.3737

15.p.73

CALOR ESPECIFICO DEL D₂O

T, °K	μ c _p , cal/mol °	$\frac{\mu c_{pD_2O}}{\mu c_{pH_2O}}$	T, °K	μ c _p , cal/mol °	$\frac{\mu c_{pD_2O}}{\mu c_{pH_2O}}$
15	0.272	—	260	10.19	1.179
20	0.532	1.086	270	10.54	1.173
30	1.043	1.060	276.92	Pto. de fusión	
40	1.524	1.040	280	20.15	1.115
50	1.977	1.043	290	19.91	1.106
60	2.403	1.043	295	19.78	1.100
70	2.821	1.044	—	—	—
80	3.234	1.052	—	—	—
90	3.629	1.052	—	—	—
100	4.047	1.066	—	—	—
110	4.508	1.092	—	—	—
120	4.931	1.112	—	—	—
130	5.325	1.126	—	—	—
140	5.709	1.143	—	—	—
150	6.100	1.159	—	—	—
160	6.500	1.171	—	—	—
170	6.895	1.174	—	—	—
180	7.282	1.186	—	—	—
190	7.666	1.187	—	—	—
200	8.050	1.194	—	—	—
210	8.422	1.187	—	—	—
220	8.802	1.191	—	—	—
230	9.158	1.185	—	—	—
240	9.500	1.186	—	—	—
250	9.842	1.178	—	—	—

15-p.76

CALOR ESPECIFICO DEL D₂O

$T, ^\circ\text{K}$	Δt	$\mu_{c.p.}$ cal/mol $^\circ$	$T, ^\circ\text{K}$	Δt	$\mu_{c.p.}$ cal/mol $^\circ$	$T, ^\circ\text{K}$	Δt	$\mu_{c.p.}$ cal/mol $^\circ$
14.81	3.652	0.243	99.32	5.340	4.005	247.69	5.671	9.785
17.56	2.189	0.403	104.57	5.051	4.254	253.87	6.034	9.999
19.89	2.874	0.532	110.10	5.749	4.519	259.50	5.020	10.18
22.60	3.160	0.660	115.67	5.092	4.781	264.81	5.159	10.36
25.97	3.645	0.831	121.44	6.276	4.996	270.52	5.756	10.69
29.56	3.115	1.027	127.51	5.736	5.236	276.92	Pto. de fusión	
32.98	3.114	1.194	133.17	5.313	5.428	279.46	3.561	20.17
37.07	4.685	1.376	138.40	4.932	5.634	283.91	4.558	19.99
38.07	5.145	1.434	143.23	4.509	5.861	289.45	5.700	19.98
41.44	3.795	1.577	147.79	4.182	6.011	295.16	5.497	19.78
42.87	4.253	1.664	153.38	6.911	6.217	—	—	—
45.14	3.347	1.764	159.98	6.156	6.534	—	—	—
46.98	3.730	1.844	166.27	6.175	6.741	—	—	—
50.70	3.668	2.016	173.10	7.065	7.027	—	—	—
54.64	3.831	2.174	180.00	6.588	7.275	—	—	—
59.23	5.226	2.354	186.59	6.136	7.539	—	—	—
59.32	2.448	2.374	192.88	5.769	7.747	—	—	—
62.37	3.307	2.504	199.19	5.875	8.029	—	—	—
65.96	3.737	2.643	205.36	5.754	8.270	—	—	—
69.77	3.773	2.813	211.45	5.934	8.456	—	—	—
73.99	4.535	2.988	217.19	5.641	8.711	—	—	—
78.61	4.612	3.179	223.11	5.401	8.894	—	—	—
83.16	4.345	3.359	229.34	5.538	9.138	—	—	—
87.92	4.860	3.541	235.39	5.681	9.324	—	—	—
93.51	6.211	3.776	241.57	5.594	9.519	—	—	—

15-p.74

CALOR ESPECIFICO DEL AGUA

$T(^{\circ}\text{K})$	$C_p(\text{obs})$ (cal/mol)	$C_p(\text{calc})$ (cal/mol)	% error
273.15(p.f.)	18.15	17.40	-4.13
283.15	18.06	15.84	-12.3
293.15	17.99	16.61	-7.67
313.15	17.98	17.39	-3.28
353.15	18.06	18.94	-0.11
373.15(p.e.)	18.14	18.33	1.05
423.15	...	19.04	...

6-p.1469

CALOR ESPECIFICO DEL D₂O A PRESION CONSTANTE C_p Kcal/Kg ° (fase líquida)

$\begin{matrix} t \\ p \end{matrix}$	1	20	40	60	80	100
20	1.005	1.004	1.003	1.002	1.001	1.000
40	1.001	1.000	0.999	0.998	0.997	0.996
60	0.999	0.998	0.997	0.996	0.995	0.994
80	0.998	0.997	0.996	0.995	0.994	0.993
100	0.998	0.997	0.996	0.994	0.993	0.992
120	—	0.998	0.997	0.995	0.994	0.992
140	—	1.001	0.999	0.997	0.996	0.995
160	—	1.007	1.005	1.003	1.001	0.999
180	—	1.019	1.017	1.015	1.013	1.010
200	—	1.039	1.036	1.033	1.030	1.028
220	—	—	1.059	1.055	1.052	1.049
240	—	—	1.092	1.087	1.083	1.079
260	—	—	—	1.133	1.127	1.121
280	—	—	—	—	1.192	1.185
300	—	—	—	—	—	1.304

 C_p Kcal/Kg ° (fase vapor)

$\begin{matrix} t \\ p \end{matrix}$	120	140	160	180	200	220	240	260	280	300	320
1	0.450	0.446	0.444	0.444	0.445	0.447	0.450	0.453	0.456	0.460	0.464
20	—	—	—	—	—	0.644	0.589	0.556	0.534	0.519	0.510
40	—	—	—	—	—	—	—	0.798	0.685	0.628	0.591
60	—	—	—	—	—	—	—	—	0.989	0.801	0.708
80	—	—	—	—	—	—	—	—	—	1.111	0.893
100	—	—	—	—	—	—	—	—	—	—	1.212
120	—	—	—	—	—	—	—	—	—	—	—
140	—	—	—	—	—	—	—	—	—	—	—
160	—	—	—	—	—	—	—	—	—	—	—
180	—	—	—	—	—	—	—	—	—	—	—
200	—	—	—	—	—	—	—	—	—	—	—
220	—	—	—	—	—	—	—	—	—	—	—
240	—	—	—	—	—	—	—	—	—	—	—
260	—	—	—	—	—	—	—	—	—	—	—
280	—	—	—	—	—	—	—	—	—	—	—
300	—	—	—	—	—	—	—	—	—	—	—
320	—	—	—	—	—	—	—	—	—	—	—
340	—	—	—	—	—	—	—	—	—	—	—
360	—	—	—	—	—	—	—	—	—	—	—
380	—	—	—	—	—	—	—	—	—	—	—
400	—	—	—	—	—	—	—	—	—	—	—
420	—	—	—	—	—	—	—	—	—	—	—
440	—	—	—	—	—	—	—	—	—	—	—
460	—	—	—	—	—	—	—	—	—	—	—
480	—	—	—	—	—	—	—	—	—	—	—
500	—	—	—	—	—	—	—	—	—	—	—

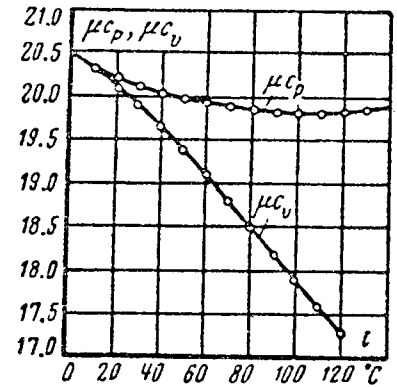
150	200	250	300	350	400	450	500
0.998	0.995	0.993	0.990	0.987	0.984	0.982	0.980
0.994	0.991	0.989	0.986	0.983	0.980	0.977	0.974
0.991	0.988	0.986	0.983	0.979	0.976	0.973	0.970
0.990	0.987	0.984	0.981	0.978	0.975	0.972	0.969
0.989	0.986	0.983	0.980	0.977	0.974	0.971	0.968
0.989	0.986	0.983	0.979	0.976	0.973	0.970	0.967
0.992	0.989	0.986	0.982	0.978	0.974	0.970	0.967
0.996	0.993	0.989	0.985	0.981	0.976	0.972	0.968
1.005	1.000	0.995	0.990	0.986	0.981	0.976	0.971
1.021	1.014	1.007	1.001	0.995	0.989	0.982	0.975
1.041	1.033	1.025	1.017	1.009	1.001	0.993	0.985
1.069	1.059	1.049	1.039	1.029	1.019	1.009	1.000
1.107	1.096	1.084	1.072	1.061	1.049	1.037	1.027
1.167	1.150	1.134	1.119	1.105	1.092	1.079	1.065
1.257	1.255	1.199	1.178	1.160	1.143	1.128	1.113

340	360	380	400	420	440	460	480	500	520	540
0.467	0.471	0.474	0.478	0.483	0.487	0.491	0.496	0.500	0.504	0.508
0.506	0.505	0.505	0.506	0.508	0.509	0.511	0.514	0.516	0.518	0.521
0.569	0.555	0.545	0.538	0.535	0.533	0.532	0.533	0.533	0.534	0.535
0.655	0.519	0.595	0.578	0.567	0.560	0.555	0.553	0.551	0.550	0.550
0.771	0.703	0.658	0.628	0.607	0.592	0.582	0.576	0.571	0.567	0.566
0.903	0.820	0.743	0.691	0.657	0.631	0.613	0.602	0.593	0.586	0.583
1.266	0.987	0.848	0.766	0.713	0.675	0.647	0.631	0.615	0.608	0.602
—	1.222	0.982	0.854	0.775	0.721	0.686	0.664	0.647	0.632	0.623
—	1.690	1.171	0.965	0.849	0.775	0.731	0.701	0.677	0.658	0.645
—	—	1.468	1.118	0.945	0.841	0.782	0.741	0.710	0.686	0.668
—	—	1.990	1.333	1.068	0.924	0.841	0.785	0.747	0.717	0.693
—	—	3.019	1.630	1.225	1.029	0.910	0.837	0.785	0.748	0.719
—	—	8.20	2.128	1.418	1.143	0.988	0.893	0.826	0.779	0.745
—	—	6.41	2.903	1.662	1.272	1.070	0.951	0.868	0.811	0.771
—	—	3.31	4.078	2.014	1.416	1.158	1.012	0.912	0.844	0.797
—	—	2.51	5.458	2.382	1.594	1.254	1.077	0.953	0.878	0.824
—	—	—	—	2.819	1.790	1.358	1.145	1.007	0.914	0.852
—	—	—	—	3.302	2.000	1.478	1.217	1.060	0.952	0.881
—	—	—	—	—	2.246	1.610	1.294	1.116	0.993	0.911
—	—	—	—	—	2.442	1.748	1.379	1.175	1.035	0.942
—	—	—	—	—	2.632	1.896	1.470	1.237	1.079	0.975
—	—	—	—	—	—	2.042	1.568	1.302	1.125	1.009
—	—	—	—	—	—	2.174	1.675	1.372	1.173	1.045
—	—	—	—	—	—	—	1.784	1.444	1.223	1.083
—	—	—	—	—	—	—	1.867	1.517	1.278	1.123
—	—	—	—	—	—	—	—	1.588	1.337	1.164

CALOR ESPECIFICO DEL D₂O

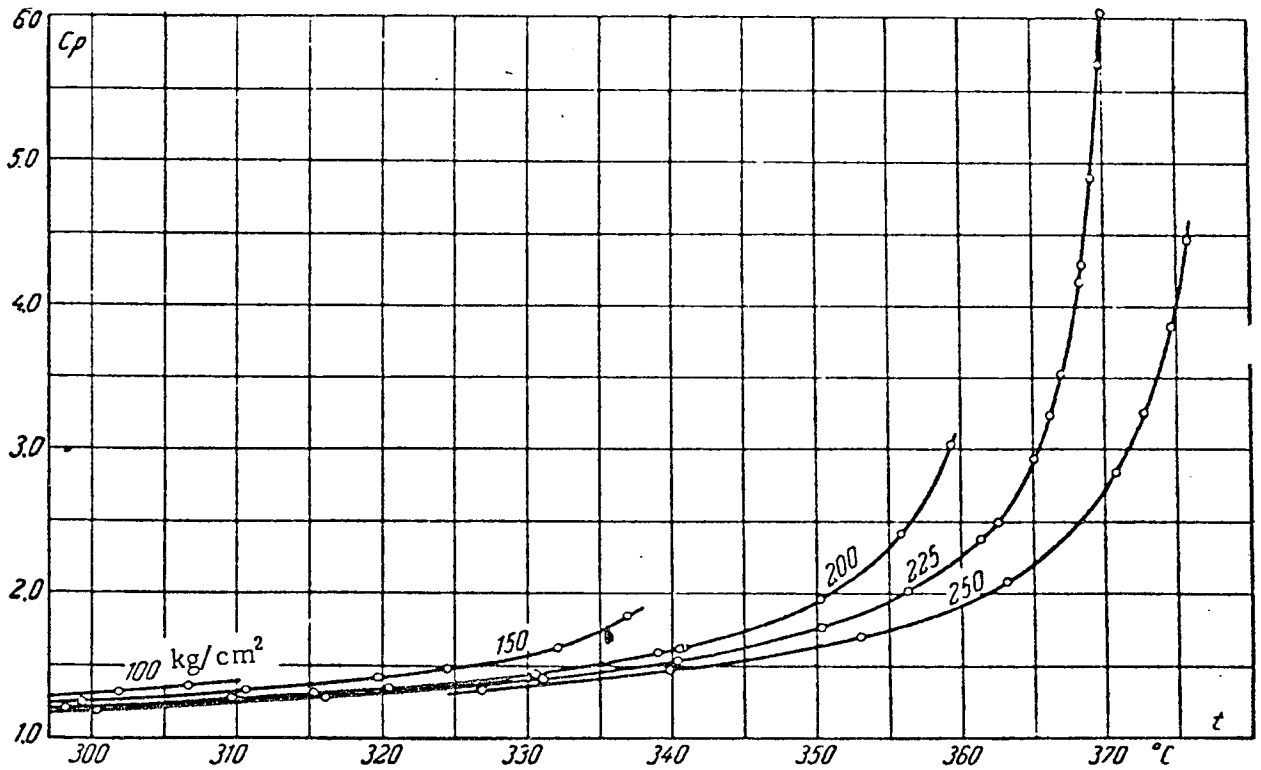
Temperatura °C	c_p .kcal/kg °
10	1.009 ₇
15	1.007 ₇
20	1.006 ₂
25	1.005 ₁
30	1.004 ₄
35	1.003 ₈
40	1.003 ₇
45	1.003 ₇
50	1.004 ₁

15-p.78

Calor específico del D₂O.

15-p.84

Kcal/Kg °



Calor específico del agua pesada.

15-p.96

CALOR ESPECIFICO DEL D₂O 99,87%

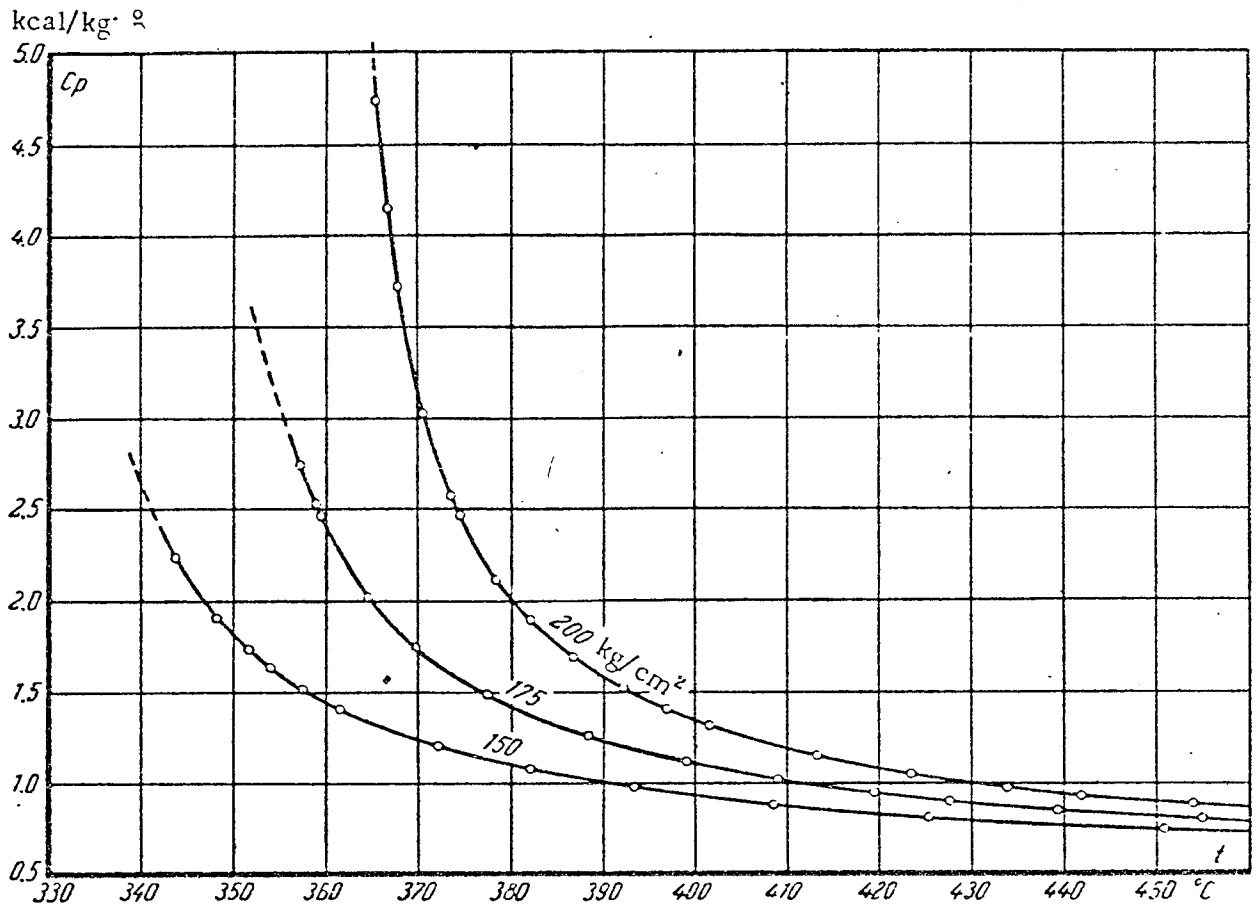
100 kg/cm ²			150 kg/cm ²			200 kg/cm ²		
<i>t</i> , °C	<i>c_p</i> , Kcal/Kg °	Δ <i>t</i> , °C	<i>t</i> , °C	<i>c_p</i> , Kcal/Kg °	Δ <i>t</i> , °C	<i>t</i> , °C	<i>c_p</i> , Kcal/Kg °	Δ <i>t</i> , °C
201.40	1.028	5.658	191.56	1.014	5.691	234.85	1.050	4.863
250.96	1.099	5.762	251.39	1.090	5.852	276.68	1.136	4.604
275.33	1.164	4.727	275.74	1.149	5.453	280.20	1.146	4.142
301.85	1.314	4.520	299.20	1.245	4.616	298.16	1.206	4.434
306.73	1.359	4.340	299.29	1.247	4.142	309.69	1.267	4.167
—	—	—	310.54	1.325	4.090	315.29	1.302	3.983
—	—	—	319.68	1.413	3.946	320.41	1.342	4.077
—	—	—	324.51	1.483	3.339	330.54	1.446	3.910
—	—	—	332.14	1.622	3.124	339.05	1.593	6.303
—	—	—	336.96	1.843	5.453	340.61	1.625	3.614
—	—	—	—	—	—	340.72	1.630	3.651
—	—	—	—	—	—	350.30	1.954	3.088
—	—	—	—	—	—	355.94	2.414	4.204
—	—	—	—	—	—	359.40	3.031	1.999

225 kg/cm ²			250 kg/cm ²		
<i>t</i> , °C	<i>c_p</i> , Kcal/Kg °	Δ <i>t</i> , °C	<i>t</i> , °C	<i>c_p</i> , Kcal/Kg °	Δ <i>t</i> , °C
275.46	1.124	4.869	326.92	1.332	6.379
300.33	1.199	4.645	339.91	1.462	5.915
316.01	1.285	4.384	353.08	1.697	8.482
331.03	1.410	3.919	363.26	2.076	6.728
340.37	1.534	3.627	370.74	2.843	3.502
350.40	1.765	4.962	372.84	3.256	3.041
366.40	2.015	4.482	374.68	3.862	2.567
361.47	2.378	3.703	375.84	4.471	2.242
362.56	2.495	3.878	376.77	5.177	1.939
365.09	2.932	3.321	377.96	6.498	1.543
366.27	3.237	2.744	378.43	7.404	1.349
367.06	3.522	2.772	379.15	9.010	1.104
368.38	4.176	2.355	—	—	—
368.57	4.288	2.027	—	—	—
369.20	4.899	2.063	—	—	—
369.75	5.692	1.774	—	—	—
369.96	6.047	1.672	—	—	—

CALOR ESPECIFICO DEL D₂O 99,87% EN LA REGION SUPERCRITICA DE PRESION Y TEMPERATURA

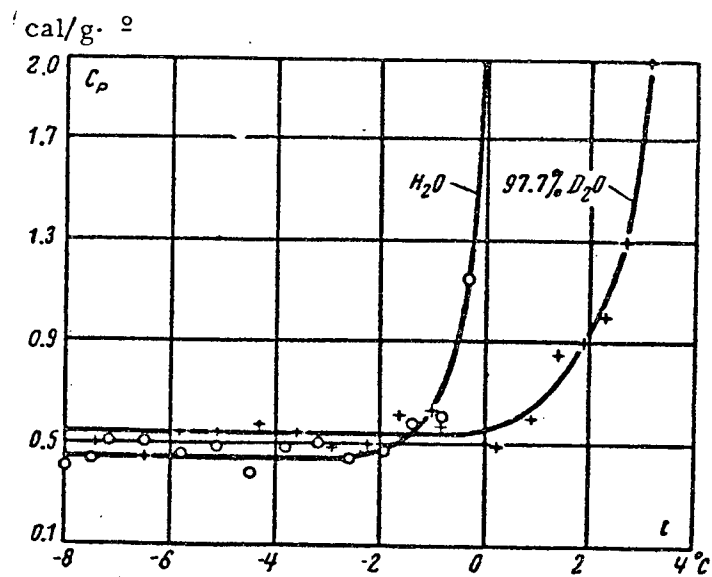
225 kg/cm ²			240 kg/cm ²			250 kg/cm ²		
t, °C	c _p , kcal/kg. °	Δt, °C	t, °C	c _p , kcal/kg. °	Δt, °C	t, °C	c _p , kcal/kg. °	Δt, °C
257.24	1.085	5.133	364.31	2.326	2.460	333.30	1.385	3.864
285.07	1.147	4.862	368.77	2.965	1.977	345.38	1.537	3.581
308.18	1.238	4.504	372.26	4.089	1.549	357.53	1.825	2.907
342.87	1.579	3.553	375.00	7.178	0.9700	366.81	2.336	2.795
357.74	2.098	3.267	376.48	14.08	0.5994	374.55	3.814	1.866
366.93	3.466	1.981	376.92	19.20	0.4505	376.30	4.792	1.466
368.76	4.460	1.524	377.25	23.01	0.3714	378.51	7.558	0.9158
370.41	7.034	0.9824	377.56	26.02	0.3320	379.81	11.35	0.6032
371.23	10.94	0.6310	377.71	26.44	0.3244	380.72	14.83	0.4582
372.10	67.44	0.0968	377.90	26.38	0.3275	381.07	15.81	0.4356
372.67	45.55	0.1512	378.20	23.38	0.3667	381.44	16.08	0.4280
374.23	10.33	0.7080	378.58	19.88	0.4330	381.63	16.06	0.4356
374.48	9.606	0.7510	378.96	15.84	0.5430	382.15	15.01	0.4685
377.77	4.931	1.506	380.72	9.025	0.9542	382.62	13.48	0.5437
378.11	4.737	1.557	384.04	5.153	1.676	383.58	10.68	0.7016
380.10	3.878	1.937	386.55	4.054	2.142	385.34	7.392	1.047
382.13	3.318	2.180	391.94	2.911	2.650	387.98	5.105	1.535
387.70	2.504	2.963	398.88	2.212	3.654	390.85	3.996	2.012
392.28	2.130	3.627	409.63	1.712	4.930	397.81	2.705	3.034
401.00	1.717	4.467	—	—	—	407.03	2.010	3.354
412.67	1.417	4.300	—	—	—	417.90	1.603	4.298
424.78	1.214	4.825	—	—	—	431.97	1.314	5.461
435.84	1.092	5.821	—	—	—	442.86	1.176	6.040
454.63	0.966	6.996	—	—	—	452.76	1.088	5.823

260 kg/cm ²			275 kg/cm ²			300 kg/cm ²		
t, °C	c _p , kcal/kg. °	Δt, °C	t, °C	c _p , kcal/kg. °	Δt, °C	t, °C	c _p , kcal/kg. °	Δt, °C
361.42	1.870	0.7521	328.99	1.303	3.097	332.89	1.310	4.170
365.52	2.076	2.874	350.47	1.539	2.614	332.90	1.311	4.181
371.73	2.613	3.846	365.02	1.896	2.700	344.73	1.408	3.888
373.97	2.954	3.354	371.83	2.265	2.770	361.85	1.663	3.292
376.51	3.487	2.898	376.64	2.730	2.256	372.98	2.009	2.717
378.20	4.151	2.452	380.87	3.538	1.754	375.76	2.136	3.053
379.79	5.132	2.010	384.70	5.082	1.252	381.75	2.568	2.529
381.68	7.238	1.511	387.31	7.105	1.217	386.45	3.170	2.328
382.68	8.933	1.218	388.16	7.824	1.123	391.10	4.245	1.714
383.68	10.87	1.019	389.14	8.360	1.049	393.10	4.836	1.502
384.35	11.74	0.9408	389.65	8.539	0.9643	395.06	5.413	1.340
384.72	11.89	0.9226	390.11	8.558	1.039	396.18	5.695	1.263
385.22	11.88	0.9269	390.66	8.460	1.056	397.30	5.892	1.243
385.79	11.48	0.9508	391.43	8.197	1.037	398.23	5.935	1.232
386.47	10.60	1.029	392.51	7.679	1.174	399.46	5.841	1.245
387.65	8.771	1.248	394.88	6.058	1.505	400.44	5.712	1.272
388.88	7.305	1.501	396.28	5.333	1.572	401.58	5.485	1.331
391.56	5.312	2.155	401.69	3.640	2.519	403.94	4.883	1.507
394.99	3.997	2.364	406.93	2.830	3.293	407.16	4.122	1.792
403.56	2.587	3.701	413.37	2.276	3.306	411.53	3.354	2.218
412.07	1.985	4.897	422.20	1.835	4.122	421.68	2.362	3.228
427.70	1.478	5.114	431.57	1.555	3.886	431.12	1.888	2.975
—	—	—	441.91	1.362	4.537	443.49	1.545	3.671
—	—	—	452.68	1.219	5.058	452.45	1.370	4.093



Calor específico del D_2O

15-p.99



Calor específico del hielo.

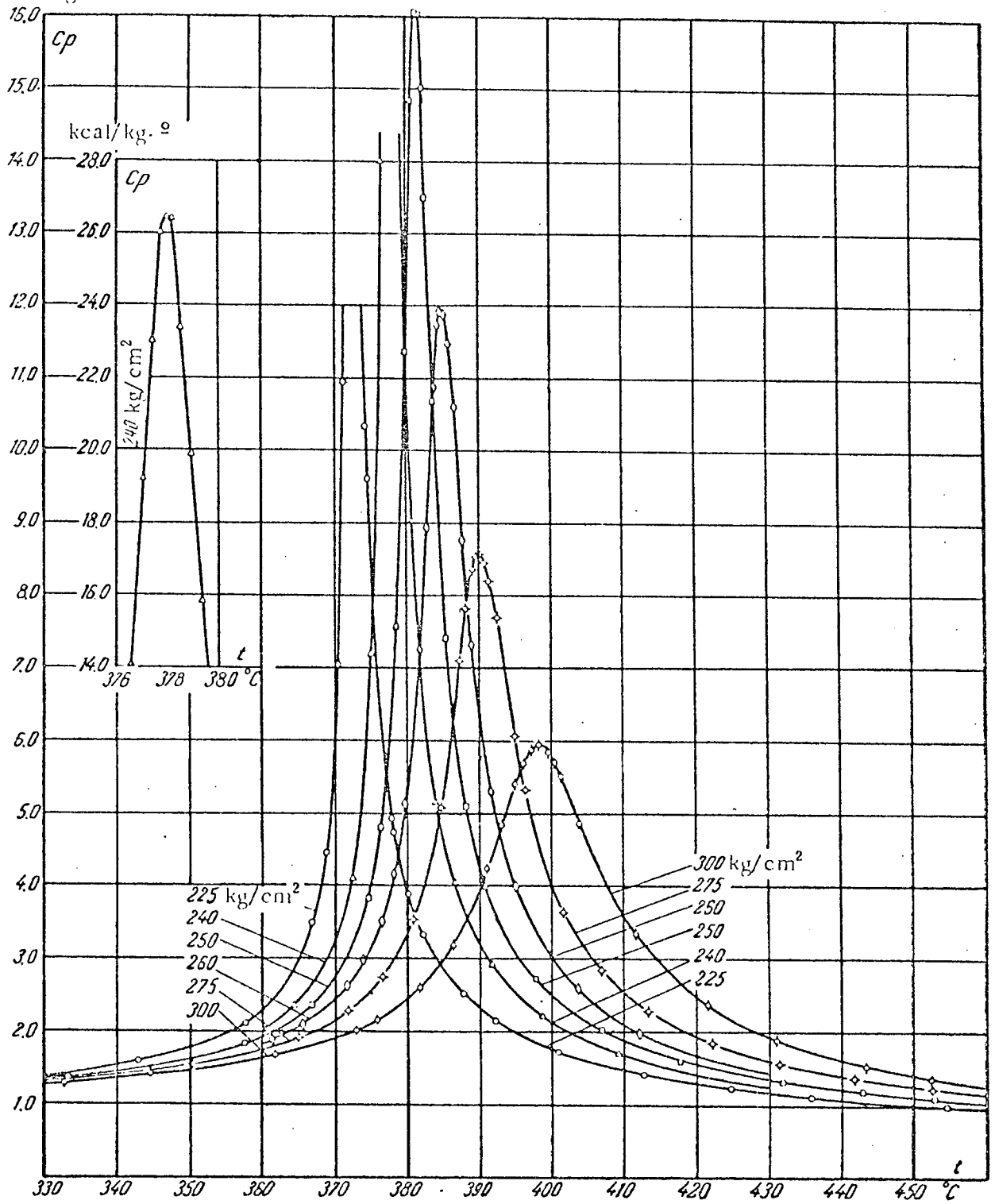
15-p.103

CALOR ESPECIFICO DEL AGUA PESADA 99,87% (FASE VAPOR)

150 kg/cm ²			175 kg/cm ²			200 kg/cm ²		
<i>t</i> , °C	<i>c_p</i> , kcal/kg·°C	Δt , °C	<i>t</i> , °C	<i>c_p</i> , kcal/kg·°C	Δt , °C	<i>t</i> , °C	<i>c_p</i> , kcal/kg·°C	Δt , °C
343.95	2.239	1.249	357.37	2.736	3.315	365.63	4.732	1.774
348.30	1.900	5.064	359.07	2.502	3.684	366.64	4.147	2.088
351.77	1.724	4.890	359.40	2.453	3.780	367.86	3.716	2.407
354.14	1.632	5.286	364.55	2.018	4.671	370.67	3.026	2.977
357.58	1.517	4.353	369.82	1.749	5.336	373.64	2.562	4.388
361.56	1.409	4.746	377.45	1.484	6.253	374.51	2.464	4.352
372.35	1.205	5.905	388.54	1.263	7.464	378.46	2.112	4.555
382.25	1.089	6.588	399.33	1.120	8.391	382.24	1.896	5.132
393.42	0.985	8.003	409.09	1.026	8.512	386.92	1.690	5.716
403.51	0.890	8.820	419.59	0.951	9.318	392.17	1.526	5.600
425.41	0.816	10.00	427.54	0.906	9.074	397.02	1.405	5.566
450.90	0.749	12.39	439.45	0.853	10.21	401.79	1.317	5.950
—	—	—	455.16	0.805	11.38	413.40	1.157	7.129
—	—	—	—	—	—	423.62	1.057	7.799
—	—	—	—	—	—	434.02	0.980	7.564
—	—	—	—	—	—	442.09	0.937	7.855
—	—	—	—	—	—	454.04	0.890	8.279

15-p.101

kcal/kg.°

Calor específico del D_2O

15-p.100

CALOR ESPECIFICO DEL D₂O

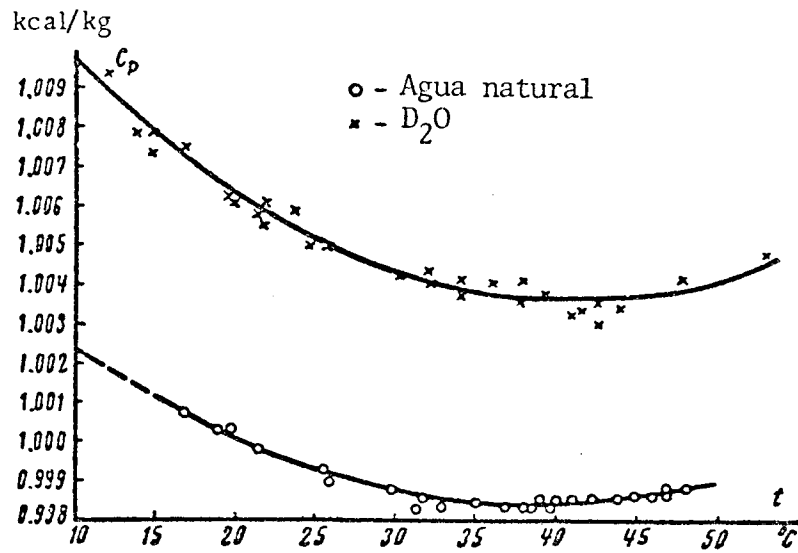
Cp= calor especifico kJ/kg°K

Temp. °C	0	1	2	3	4	5	6	7	8	9
10	4.239	4.237	4.235	4.233	4.231	4.229	4.228	4.226	4.224	4.221
20	4.221	4.220	4.218	4.217	4.215	4.214	4.213	4.212	4.210	4.207
30	4.208	4.207	4.206	4.205	4.204	4.203	4.202	4.201	4.200	4.199
40	4.198	4.197	4.196	4.195	4.195	4.194	4.193	4.192	4.191	4.191
50	4.190	4.189	4.188	4.188	4.187	4.186	4.185	4.185	4.184	4.183
60	4.183	4.182	4.181	4.181	4.180	4.179	4.179	4.178	4.177	4.177
70	4.176	4.175	4.175	4.174	4.173	4.173	4.172	4.171	4.171	4.170
80	4.170	4.169	4.168	4.168	4.167	4.167	4.166	4.165	4.165	4.165
90	4.164	4.164	4.163	4.163	4.162	4.162	4.161	4.161	4.160	4.160
100	4.159	4.159	4.158	4.158	4.158	4.158	4.157	4.157	4.157	4.157
110	4.157	4.156	4.156	4.156	4.156	4.156	4.156	4.156	4.156	4.156
120	4.155	4.155	4.157	4.157	4.157	4.157	4.158	4.158	4.158	4.159
130	4.153	4.150	4.160	4.161	4.162	4.163	4.163	4.164	4.165	4.166
140	4.167	4.168	4.169	4.170	4.172	4.173	4.174	4.176	4.177	4.179
150	4.180	4.182	4.184	4.185	4.187	4.189	4.191	4.193	4.195	4.198
160	4.200	4.203	4.205	4.208	4.210	4.213	4.215	4.219	4.222	4.225
170	4.222	4.231	4.234	4.238	4.241	4.245	4.248	4.252	4.256	4.260
180	4.264	4.268	4.272	4.277	4.281	4.285	4.290	4.295	4.300	4.305
190	4.310	4.315	4.320	4.325	4.331	4.337	4.342	4.348	4.354	4.360
200	4.366	4.372	4.378	4.385	4.391	4.398	4.404	4.411	4.418	4.425
210	4.432	4.440	4.447	4.454	4.462	4.470	4.477	4.485	4.493	4.501
220	4.510	4.518	4.526	4.535	4.544	4.552	4.561	4.570	4.579	4.588
230	4.598	4.607	4.616	4.626	4.635	4.645	4.655	4.665	4.675	4.685
240	4.696	4.705	4.716	4.727	4.738	4.748	4.759	4.770	4.781	4.792
250	4.803	4.814	4.826	4.837	4.848	4.862	4.874	4.885	4.895	4.907
260	4.917	4.929	4.940	4.952	4.964	4.976	4.989	5.001	5.014	5.027
270	5.040	5.054	5.068	5.081	5.095	5.110	5.125	5.140	5.156	5.171
280	5.187	5.203	5.220	5.237	5.254	5.272	5.290	5.309	5.327	5.347
290	5.366	5.387	5.407	5.425	5.450	5.472	5.494	5.518	5.541	5.565
300	5.590	5.615	5.642	5.669	5.695	5.724	5.753	5.783	5.814	5.845
310	5.878	5.911	5.945	5.982	6.017	6.055	6.094	6.134	6.176	6.219
320	6.253	6.309	6.357	6.406	6.457	6.510	6.566	6.622	6.682	6.745
330	6.809	6.877	6.948	7.022	7.100	7.181	7.266	7.356	7.451	7.550
340	7.656	7.768	7.886	8.012	8.146	8.289	8.443	8.608	8.785	8.976
350	9.183	9.410	9.658	9.929	10.23	10.53	10.92	11.35	11.82	12.35
360	12.94	13.62	14.40	15.31	16.40	17.74	19.47	21.80	25.19	30.66

CALOR ESPECIFICO DEL D₂O

Temperatura °C	c_p , Kcal/Kg °	Temperatura °C	c_p , Kcal/Kg °
11.97	1.009 ₄	31.92	1.004 ₄
13.88	1.007 ₉	32.01	1.004 ₁
14.66	1.007 ₉	33.83	1.003 ₈
14.78	1.007 ₄	33.92	1.004 ₂
16.72	1.007 ₅	35.86	1.004 ₁
18.76	1.006 ₆	37.63	1.004 ₂
19.56	1.006 ₂	37.66	1.003 ₆
19.75	1.006 ₁	38.82	1.003 ₈
19.86	1.006 ₄	41.00	1.003 ₃
21.53	1.005 ₃	41.24	1.003 ₄
21.75	1.006 ₁	42.06	1.003 ₇
21.75	1.005 ₆	42.35	1.003 ₁
23.56	1.005 ₉	43.78	1.003 ₅
24.69	1.005 ₁	47.84	1.004 ₂
25.53	1.005 ₀	52.65	1.004 ₉
30.03	1.004 ₃	-----	-----

15-p.78

Calor específico del agua natural y D₂O

15-p.77

CALOR ESPECIFICO DEL AGUA PESADA

T(°K)	C _p (obs) (cal/mol)	C _p (calc) (cal/mol)	% error
276.98(p.f.)	20.40	18.22	10.7
293.15	20.20	16.64	17.6
313.15	20.06	17.74	11.6
333.15	19.94	18.16	8.93
353.15	19.84	18.50	6.75
374.57(p.e.)	19.79	18.85	4.75
423.15	...	19.71	...

6-p.1470

COMPARACION DE VALORES DE CALOR ESPECIFICO OBTENIDO POR VARIOS AUTORES

T°C	Autores	μC_p , cal/mol ²	μC_p , cal/mol ² de acuerdo a Eucken y Eigen
0	Jacobs	21.2	20.4 (extrapolado)
0-18	Clusius y Bartholome	18.18	20.3
4-26	Brown, Barnes y Maass	20.4	20.3
26-45	"	20.1	20.1
4-65	"	20.2	20.1
10	Long y Kemp	20.0	20.3 (extrapolado)
30	"	19.6	20.12
15	Cockett y Ferguson	20.18	20.26
40	"	20.10	20.05
50	"	20.11	19.99

15-p.83

CALOR ESPECIFICO A PRESION CONSTANTE DEL AGUA Y DEL VAPOR

[illegible]

Continuación

Temp. °F Presión Agua Sat. Vapor Sat.	c _p , Btu/lbm × F															Temp. °F Presión Agua Sat. Vapor Sat.
	150	200	300	400	500	600	800	1000	1500	2000	3000	4000	6000	8000	10000	
1500	0.562	0.563	0.565	0.567	0.571	0.576	0.580	0.590	0.601	0.623	0.645	0.691	0.737	0.780	0.868	1500
1480	0.561	0.562	0.564	0.566	0.570	0.575	0.579	0.590	0.601	0.623	0.647	0.694	0.742	0.785	0.878	1480
1460	0.559	0.560	0.562	0.565	0.569	0.573	0.578	0.589	0.601	0.621	0.648	0.695	0.747	0.793	0.888	1460
1440	0.557	0.559	0.561	0.563	0.568	0.572	0.577	0.589	0.600	0.620	0.650	0.701	0.753	0.800	0.900	1440
1420	0.556	0.557	0.559	0.562	0.566	0.571	0.576	0.588	0.600	0.620	0.651	0.703	0.756	0.803	0.909	1420
1400	0.554	0.555	0.558	0.560	0.565	0.570	0.575	0.587	0.600	0.626	0.652	0.709	0.765	0.817	0.926	1400
1380	0.553	0.554	0.556	0.559	0.564	0.569	0.574	0.587	0.600	0.627	0.655	0.714	0.773	0.827	0.939	1380
1360	0.551	0.552	0.555	0.558	0.563	0.568	0.573	0.586	0.600	0.628	0.657	0.716	0.781	0.838	0.953	1360
1340	0.549	0.551	0.553	0.556	0.561	0.567	0.572	0.585	0.600	0.629	0.660	0.725	0.790	0.850	0.968	1340
1320	0.548	0.549	0.552	0.555	0.560	0.566	0.571	0.585	0.600	0.630	0.663	0.731	0.800	0.864	0.983	1320
1300	0.546	0.548	0.550	0.553	0.559	0.565	0.570	0.585	0.600	0.632	0.666	0.738	0.811	0.879	0.998	1300
1280	0.545	0.546	0.549	0.552	0.558	0.564	0.570	0.585	0.600	0.634	0.669	0.746	0.824	0.897	1.014	1280
1260	0.543	0.544	0.547	0.550	0.556	0.563	0.569	0.585	0.601	0.636	0.673	0.755	0.838	0.918	1.036	1260
1240	0.541	0.543	0.546	0.549	0.555	0.562	0.568	0.584	0.601	0.638	0.676	0.765	0.855	0.942	1.063	1240
1220	0.540	0.541	0.544	0.548	0.554	0.561	0.567	0.584	0.602	0.641	0.683	0.777	0.875	0.969	1.092	1220
1200	0.538	0.540	0.543	0.546	0.553	0.560	0.567	0.584	0.603	0.644	0.689	0.790	0.897	1.000	1.095	1200
1180	0.536	0.538	0.541	0.545	0.552	0.559	0.566	0.584	0.604	0.647	0.696	0.805	0.922	1.033	1.117	1180
1160	0.535	0.536	0.540	0.544	0.551	0.558	0.565	0.585	0.606	0.652	0.704	0.823	0.942	1.070	1.143	1160
1140	0.533	0.535	0.539	0.542	0.550	0.557	0.565	0.585	0.607	0.656	0.713	0.843	0.965	1.107	1.187	1140
1120	0.531	0.533	0.537	0.541	0.549	0.557	0.565	0.585	0.609	0.662	0.723	0.866	1.025	1.149	1.190	1120
1100	0.530	0.532	0.536	0.540	0.548	0.556	0.564	0.587	0.612	0.668	0.735	0.893	1.070	1.193	1.220	1100
1080	0.528	0.530	0.534	0.538	0.547	0.555	0.564	0.588	0.615	0.676	0.749	0.924	1.120	1.242	1.240	1080
1060	0.527	0.529	0.533	0.537	0.546	0.555	0.564	0.590	0.618	0.685	0.765	0.960	1.176	1.295	1.280	1060
1040	0.525	0.527	0.532	0.536	0.545	0.555	0.565	0.592	0.622	0.695	0.783	1.002	1.238	1.351	1.322	1040
1020	0.523	0.526	0.530	0.535	0.545	0.555	0.565	0.594	0.627	0.707	0.804	1.051	1.306	1.399	1.298	1020
1000	0.522	0.524	0.529	0.531	0.541	0.555	0.566	0.597	0.633	0.721	0.829	1.110	1.382	1.471	1.306	1000
980	0.520	0.523	0.528	0.533	0.544	0.555	0.567	0.601	0.640	0.737	0.858	1.180	1.475	1.531	1.312	980
960	0.519	0.521	0.527	0.532	0.543	0.556	0.568	0.605	0.648	0.756	0.893	1.267	1.595	1.595	1.310	960
940	0.517	0.520	0.526	0.531	0.543	0.556	0.570	0.610	0.658	0.778	0.934	1.376	1.708	1.639	1.299	940
920	0.516	0.519	0.525	0.531	0.544	0.558	0.573	0.617	0.669	0.803	0.984	1.520	1.819	1.667	1.281	920
900	0.515	0.518	0.524	0.530	0.544	0.559	0.576	0.624	0.683	0.834	1.048	1.716	1.832	1.660	1.239	900
880	0.513	0.516	0.523	0.530	0.545	0.561	0.580	0.633	0.699	0.872	1.130	1.993	2.000	1.633	1.232	880
860	0.512	0.515	0.522	0.530	0.546	0.564	0.584	0.644	0.718	0.918	1.240	2.310	2.019	1.593	1.212	860
840	0.511	0.514	0.522	0.530	0.548	0.568	0.590	0.657	0.740	0.977	1.395	2.633	1.978	1.547	1.192	840
820	0.510	0.514	0.522	0.531	0.550	0.572	0.597	0.672	0.767	1.054	1.620	2.886	1.883	1.503	1.175	820
800	0.509	0.513	0.522	0.532	0.553	0.577	0.605	0.690	0.800	1.100	1.987	2.872	1.785	1.459	1.157	800
780	0.508	0.513	0.522	0.533	0.557	0.584	0.615	0.712	0.840	1.312	2.550	2.517	1.670	1.416	1.142	780
760	0.507	0.512	0.523	0.535	0.561	0.592	0.628	0.738	0.892	1.542	2.462	2.156	1.576	1.370	1.126	760
740	0.507	0.512	0.524	0.537	0.567	0.602	0.642	0.770	0.960	1.913	2.119	1.888	1.483	1.332	1.111	740
720	0.506	0.512	0.525	0.540	0.574	0.613	0.660	0.811	1.052	2.584	2.458	1.696	1.421	1.290	1.100	720
700	0.505	0.513	0.528	0.544	0.582	0.627	0.681	0.861	1.181	2.145	2.237	1.557	1.378	1.230	1.089	700
680	0.506	0.514	0.530	0.549	0.592	0.644	0.707	0.927	1.265	2.169	1.789	1.450	1.303	1.217	1.079	680
660	0.507	0.515	0.534	0.555	0.604	0.665	0.738	1.015	1.639	1.851	1.587	1.399	1.256	1.187	1.071	660
640	0.507	0.517	0.538	0.562	0.619	0.690	0.777	1.135	2.219	1.601	1.434	1.303	1.216	1.157	1.063	640
620	0.509	0.519	0.543	0.571	0.637	0.720	0.826	1.305	1.614	1.455	1.362	1.252	1.184	1.136	1.036	620
600	0.510	0.522	0.550	0.582	0.639	0.757	0.888	1.586	1.453	1.358	1.295	1.211	1.157	1.118	1.032	600
580	0.513	0.526	0.558	0.595	0.685	0.804	0.969	1.503	1.351	1.289	1.243	1.178	1.134	1.102	1.046	580
560	0.516	0.531	0.568	0.611	0.717	0.862	1.079	1.309	1.281	1.237	1.202	1.151	1.115	1.087	1.039	560
540	0.519	0.539	0.580	0.630	0.756	0.937	1.272	1.249	1.229	1.196	1.169	1.128	1.093	1.074	1.031	540
520	0.524	0.545	0.594	0.653	0.804	1.035	1.221	1.204	1.189	1.164	1.142	1.109	1.083	1.062	1.024	520
500	0.530	0.554	0.611	0.680	0.835	1.187	1.181	1.169	1.157	1.137	1.120	1.092	1.069	1.051	1.017	500
480	0.537	0.565	0.632	0.711	1.159	1.154	1.150	1.140	1.131	1.115	1.101	1.077	1.057	1.041	1.010	480
460	0.545	0.573	0.657	0.755	1.132	1.128	1.125	1.117	1.110	1.096	1.081	1.064	1.047	1.033	1.004	460
440	0.556	0.594	0.687	1.113	1.110	1.107	1.104	1.098	1.092	1.089	1.070	1.052	1.038	1.025	0.999	440
420	0.568	0.614	0.724	1.094	1.094	1.089	1.087	1.081	1.076	1.067	1.058	1.042	1.029	1.018	0.994	420
400	0.583	0.633	1.079	1.078	1.076	1.074	1.072	1.067	1.063	1.055	1.047	1.034	1.022	1.011	0.990	400
380	0.601	1.095	1.065	1.065	1.063	1.061	1.059	1.056	1.052	1.044	1.038	1.026	1.015	1.006	0.986	380
360	0.622	1.051	1.054	1.053	1.052	1.050	1.049	1.045	1.042	1.036	1.030	1.019	1.009	1.001	0.982	360
340	1.015	1.044	1.044	1.043	1.042	1.040	1.039	1.036	1.033	1.028	1.022	1.013	1.004	0.996	0.979	340
320	1.036	1.036	1.035	1.034	1.033	1.032	1.031	1.028	1.026	1.021	1.016	1.007	0.999	0.992	0.976	320
300	1.028	1.028	1.028	1.027	1.026	1.025	1.024	1.022	1.019	1.015	1.010	1.002	0.995	0.988	0.973	300
280	1.022	1.022	1.021	1.021	1.020	1.019	1.018	1.016	1.014	1.009	1.005	0.998	0.991	0.985	0.971	280
260	1.016	1.016	1.016	1.015	1.014	1.013	1.013	1.011	1.009	1.005	1.001	0.994	0.988	0.982	0.968	260
240	1.012	1.011	1.011	1.011	1.010	1.009	1.008	1.006	1.004	1.001	0.997	0.991	0.985	0.979	0.966	240
220	1.008	1.008	1.007	1.007	1.006	1.005	1.005	1.003	1.001	0.998	0.994	0.988	0.982	0.977	0.964	220
200	1.005	1.004	1.004	1.004	1.003	1.002	1.002	1.000	0.998	0.995	0.992	0.986	0.980	0.975	0.963	200
180	1.002	1.002	1.002	1.001	1.001	1.000	0.999	0.998	0.996	0.993	0.990	0.984	0.978	0.973	0.961	180
160	1.000	1.000	1.000	0.999	0.999	0.998	0.997	0.996	0.994	0.991	0.987	0.981	0.976	0.971	0.959	160
140	0.999	0.999	0.998	0.998	0.997	0.997	0.996	0.994	0.992	0.989	0.986	0.980	0.974	0.969	0.958	140

COEFICIENTE DE COMPRESIBILIDAD
ISOTERMICA X PARA D₂O 100%

T (°K)	X . 10 ⁵ (atm. ⁻¹)
283	+ 4,86
293	4,65
313	4,44
333	4,44
353	4,59
373	4,86

13-p.33

COEFICIENTE DE TERMODIFUSION EN EL SISTEMA D₂O Y H₂O

$$\frac{D'}{D} = 7.10^{-5} \pm 3.10^{-5} \text{ temp.}^{-1}$$

13-p. 30

COEFICIENTE DE DIFUSION DEL H₂O MEDIDO POR EL DEUTERIO
D x 10⁵ (en cm²/seg)

T °C	Método del capilar	Método del diafragma
0,0 ± 0,1	1,00 ± 0,011	1,29
5,2 ± 0,1	1,23 ± 0,017	
16,1 ± 0,05	1,65 ± 0,035	
17,5		1,77
25,00 ± 0,01	2,14 ± 0,032	2,12
35,00 ± 0,02	2,76 ± 0,037	2,75
45,0 ± 0,05	3,45 ± 0,024	3,52
55,0 ± 0,15	4,12 ± 0,074	4,39

13-p.27

COEFICIENTE DE DIFUSION DEL HIELO

$$D = 1,0^{-10} \text{ cm}^2 \text{ seg}^{-1}$$

13-p.27

DIFUSION DEL HD¹⁶O, H₂¹⁸O EN H₂O
D x 10⁵ (en cm²/seg)

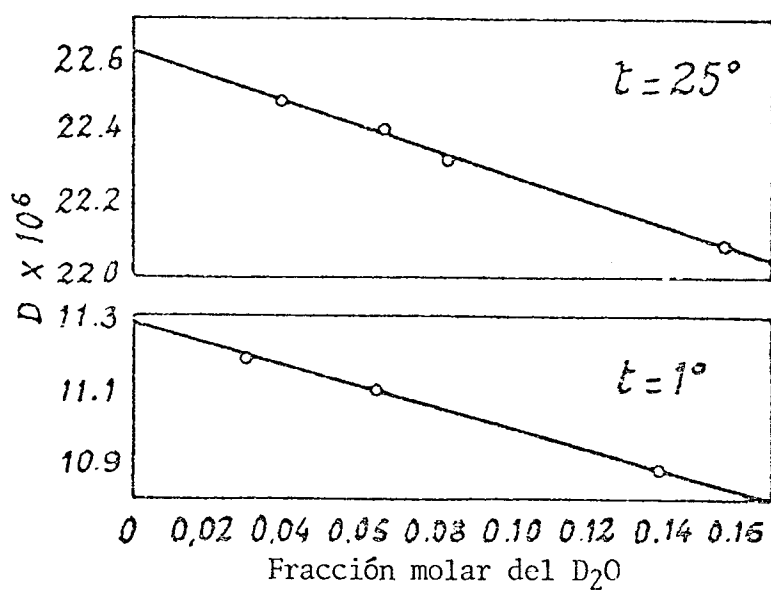
T °C	HD ¹⁶ O	H ₂ ¹⁸ O
1,11		1,44 ± 0,097
4,9		1,55 ± ,062
5,0		
10,0	1,57 ± 0,04	1,90 ± ,04
15,0		
18,0	2,06 ± ,05	2,35 ± ,16
25,0	2,34 ± ,08	2,66 ± ,12
35,0		3,49 ± ,15
45,0	3,87 ± ,07	4,38 ± ,11
55,0	4,95 ± ,08	5,45 ± ,30

13-p.28

COEFICIENTE DE DIFUSION DEL H₂O MEDIDO POR EL ¹⁸O

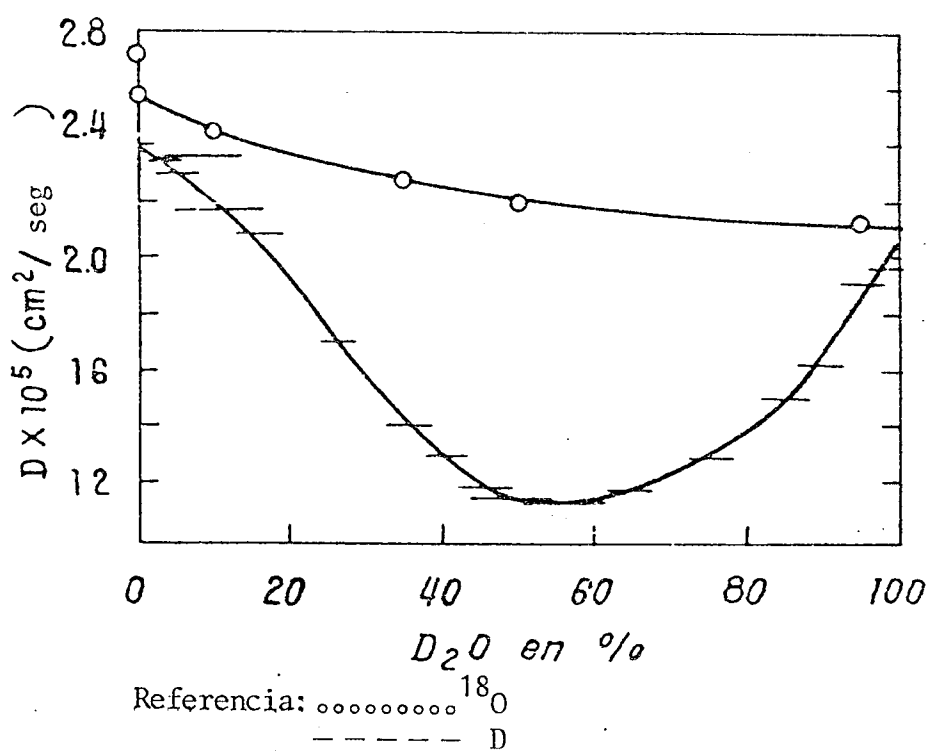
T °C	D x 10 ⁵ (en cm ² /seg)
1,11 ± 0,09	1,52 ± 0,07
4,9 ± ,10	1,71 ± ,027
10,0 ± ,04	2,01 ± ,09
18,0 ± ,03	2,51 ± ,20
25,0 ± ,01	3,01 ± ,22
35,0 ± ,01	3,87 ± ,052
45,0 ± ,02	4,68 ± ,12
55,0 ± ,03	5,83 ± ,30

13-p.28



Variación del coeficiente de difusión con la fracción molar del D_2O .

13-p.29



Coeficiente de difusión de las mezclas D_2O Y H_2O , medido por el ^{18}O y D .

13-p.29

COEFICIENTE DE DIFUSION DEL H_2O , MEDIDO POR EL HDO

$$D \times 10^6 \text{ (cm}^2 \text{ seg.}^{-1}\text{)} :$$

11,28 a 1°C

22,61 a 25°C

13-p.28

COEFICIENTE DE DIFUSION DE MEZCLAS DE D_2O Y H_2O MEDIDO POR EL DEUTERIO

$$D = 2,26 \text{ a } 2,32 \times 10^{-5} \text{ cm}^2 \text{ seg}^{-1} \text{ para } T = 25,0^\circ\text{C} \pm 0,4^\circ\text{C}$$

13-p.29

COEFICIENTE DE DIFUSION MUTUO ENTRE H_2O Y D_2O

$$\text{a } 5^\circ\text{C} \quad 10^5 D = 1,295(1 - 0,2390 N + 0,0375 N^2) \pm 0,001$$

$$\text{a } 25^\circ\text{C} \quad 10^5 D = 2,272(1 - 0,1963 N + 0,0335 N^2) \pm 0,003$$

$$\text{a } 45^\circ\text{C} \quad 10^5 D = 3,532(1 - 0,1666 N + 0,0236 N^2) \pm 0,003$$

N = Fracción molar de D_2O en la mezcla

D en $\text{cm}^2/\text{seg.}$

13-p.30

COEFICIENTE DE DIFUSION DEL D_2O Y H_2O VAPOR EN EL AIRE

Gas	T ($^\circ\text{C}$)	$D_{12}^\circ (\text{cm}^2 \text{ seg}^{-1})$
H_2O - air	24,8	0,257
D_2O - air	24,8	0,247
D_2O - air	40,0	0,227
D_2O - air	45,0	0,288
D_2O - air	60,0	0,314
$(D_{12}^\circ = \text{coeficiente de difusión corregido a } 760 \text{ mm.})$		

13-p.30

COEFICIENTE DE DILATACION CUBICA DEL D₂O

$$\begin{aligned}\alpha \cdot 10^4 &= 23,84 \text{ para H}_2\text{O}, \\ &= 22,82 \text{ para D}_2\text{O} \quad 99,8\%\end{aligned}$$

13-p.34

EXPANSION TERMICA DEL AGUA PESADA
ENTRE 10 y 13 °C

Rango de temperat.	$-\Delta d_{\text{H}_2\text{O}} \cdot 10^6$	$-\Delta d_{\text{D}_2\text{O}} \cdot 10^6$		
		1	2	Promed.
10.0—10.2	17.8	—3.5	—3.5	—3.5
10.2—10.4	18.4	—3.1	—3.3	—3.2
10.4—10.6	19.1	—2.3	—2.4	—2.4
10.6—10.8	19.5	—1.8	—1.6	—1.7
10.8—11.0	20.1	—1.1	—0.9	—1.0
11.0—11.1	10.3	—0.20	—0.25	—0.23
11.1—11.2	10.4	—0.15	—0.11	—0.13
11.2—11.3	10.4	—0.03	—0.07	—0.05
11.3—11.4	10.6	+0.18	+0.16	+0.17
11.4—11.5	10.8	+0.36	+0.41	+0.38
11.5—11.6	10.9	+0.51	+0.46	+0.49
11.6—11.7	10.9	+0.67	+0.64	+0.65
11.7—11.8	11.2	+0.81	+0.88	+0.85
11.8—11.9	11.2	+1.01	+1.07	+1.04
11.9—12.0	11.4	+1.25	+1.21	+1.23
12.0—12.2	23.1	+2.8	+2.9	+2.9
12.2—12.4	23.6	+3.4	+3.2	+3.3
12.4—12.6	24.2	+4.1	+3.9	+4.0
12.6—12.8	24.7	+4.8	+4.5	+4.6
12.8—13.0	25.1	+5.2	+5.0	+5.1

15-p.30

EXPANSION TERMICA DEL AGUA PESADA ENTRE 13 Y 27 °C

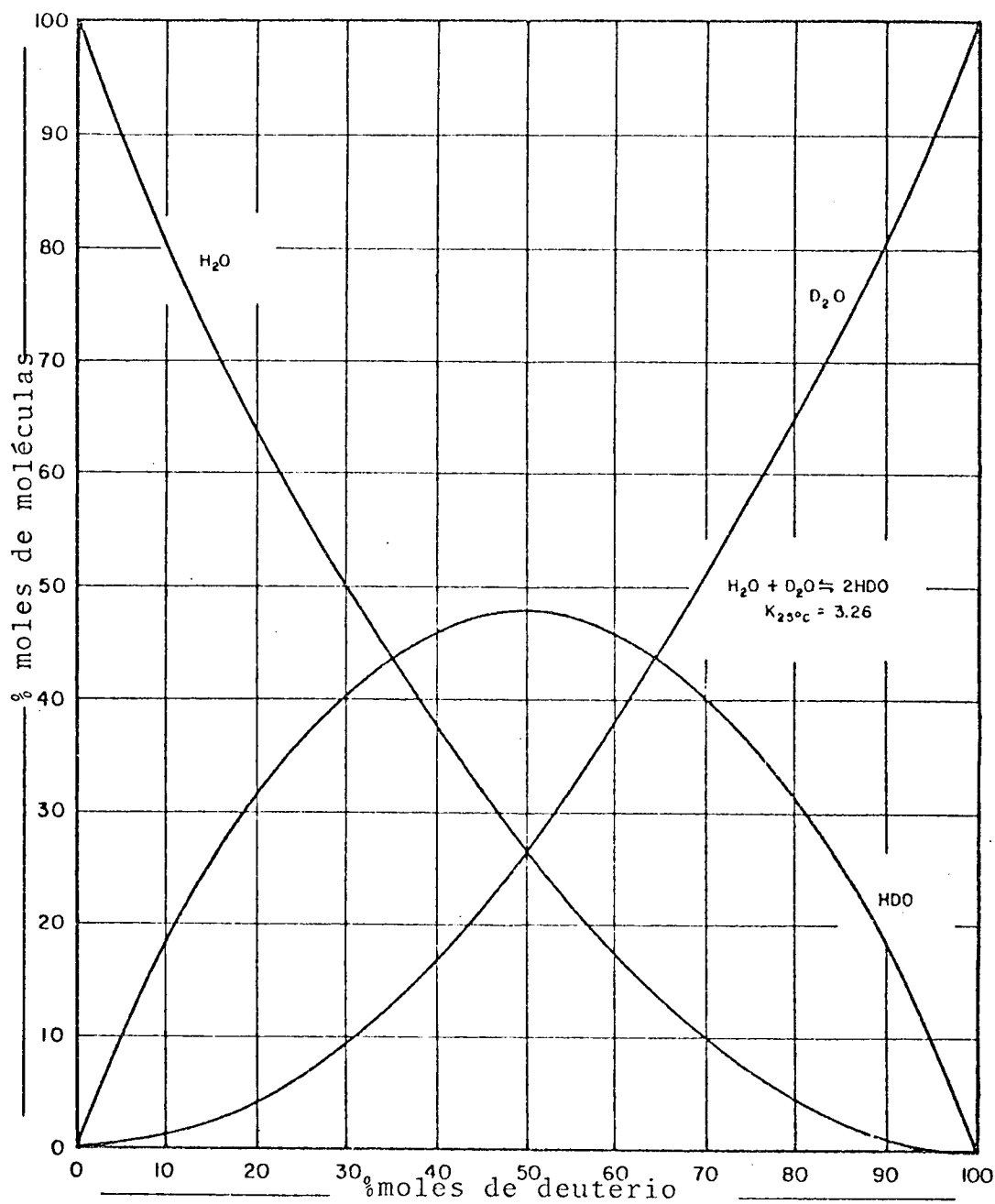
Rango de temp.	$-\Delta d_{H_2O} \cdot 10^6$	$-\Delta d_{D_2O} \cdot 10^6$				Promedio
		1	2	3	4	
13.0—13.5	64.9	17.0	16.8	17.6	17.6	17.3
13.5—14.0	67.9	20.6	20.4	21.3	21.0	20.8
14.0—14.5	70.9	24.9	24.2	25.1	24.8	24.7
14.5—15.0	73.8	29.1	28.8	29.0	30.2	29.3
15.0—15.5	76.8	32.7	33.0	33.2	31.2	32.5
15.5—16.0	79.6	37.0	37.3	35.7	35.3	36.3
16.0—16.5	82.5	40.0	39.0	39.5	39.5	39.5
16.5—17.0	85.4	43.8	42.1	43.1	43.3	43.1
17.0—17.5	88.1	46.7	46.6	46.5	46.8	46.6
17.5—18.0	90.9	49.0	50.4	49.1	50.1	49.7
18.0—18.5	93.7	54.9	55.0	52.7	52.7	53.8
18.5—19.0	96.4	57.4	56.5	56.6	55.9	56.6
19.0—19.5	99.0	59.8	60.1	60.4	60.2	60.1
19.5—20.0	101.8	63.6	63.6	64.1	62.6	63.5
20.0—20.5	104.3	68.7	68.3	67.1	65.6	67.4
20.5—21.0	107.0	70.2	70.1	69.9	71.5	70.4
21.0—21.5	109.6	73.5	73.8	73.5	72.5	73.3
21.5—22.0	112.1	74.7	76.3	77.7	76.7	76.4
22.0—22.5	114.7	80.7	79.3	79.7	78.7	79.6
22.5—23.0	117.2	82.3	83.0	82.4	83.6	82.8
23.0—23.5	119.7	86.0	86.9	86.7	84.6	86.1
23.5—24.0	122.1	86.3	90.1	89.3	88.4	88.4
24.0—24.5	124.6	91.8	91.2	92.2	92.6	92.0
24.5—25.0	127.1	96.7	95.8	94.7	95.5	95.7
25.0—25.5	129.4	97.5	99.0	97.9	96.3	97.7
25.5—26.0	131.7	101.2	101.8	101.5	101.8	101.6
26.0—26.5	134.2	104.4	104.7	103.7	104.5	104.3
26.5—27.0	136.5	105.5	106.9	107.9	105.1	106.4
$\Sigma \Delta d \cdot 10^6$	2861.9	1796.0	1801.0	1798.1	1788.6	1795.9

15-p.31

COEFICIENTE PIEZO OPTICO ADIABATICO.

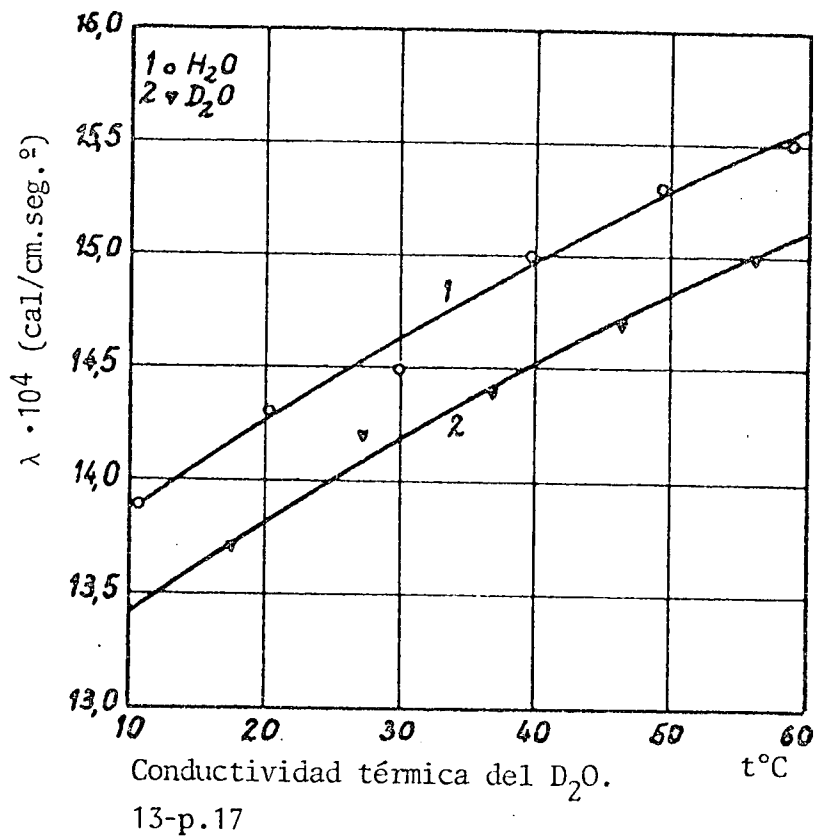
D_2O 99,8% : $10,51 \cdot 10^{-6}$ por atm.
 H_2O : $14,66 \cdot 10^{-6}$

13-p.9



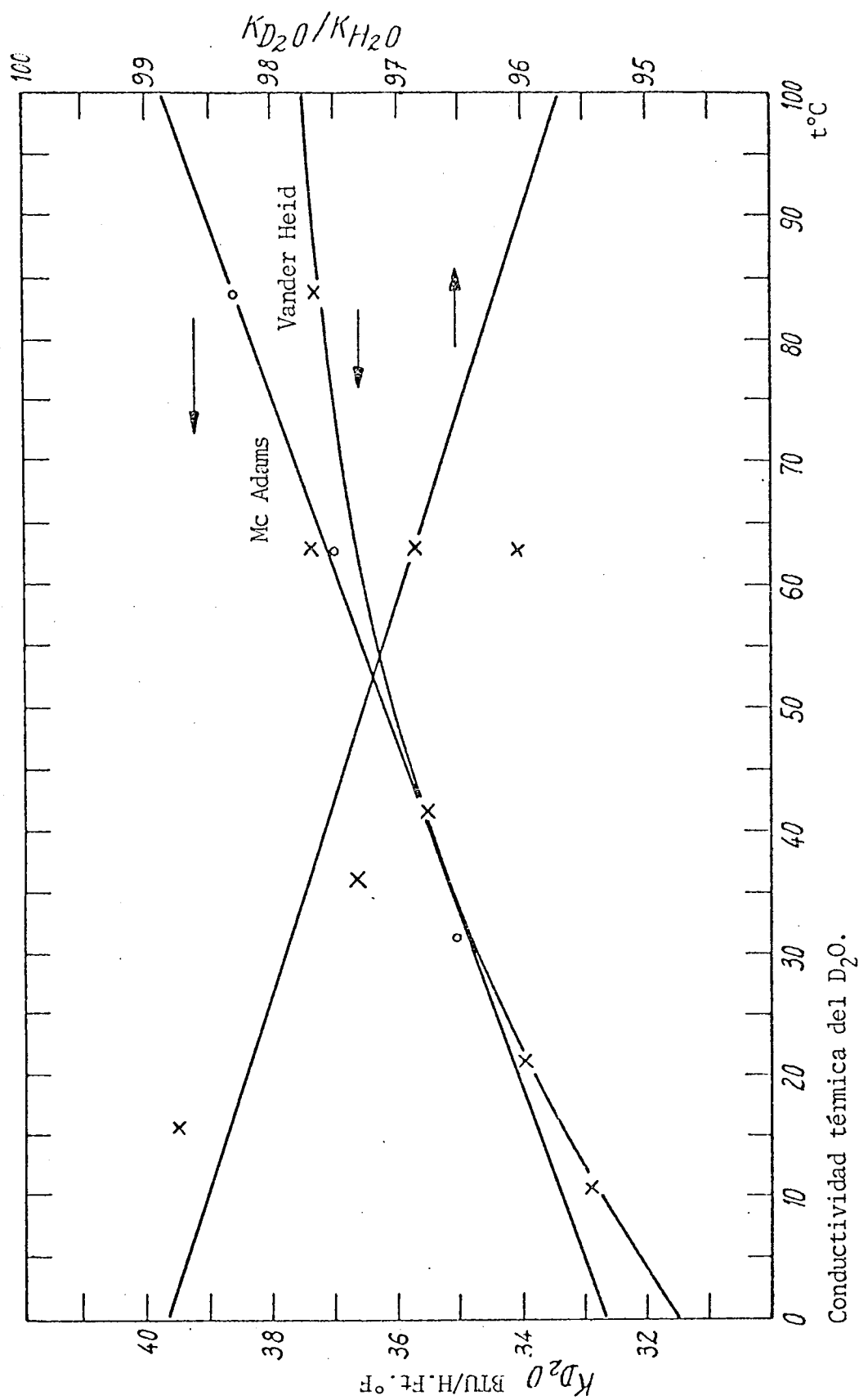
Concentraciones de equilibrio del H_2O , HDO y D_2O en función de la concentración total de deuterio en agua

3-p.128



CONDUCTIVIDAD TERMICA DEL AGUA PESADA

t, °C	$\lambda_{D_2O}/\lambda_{H_2O}$	λ_{D_2O}	
		cal	kcal
		cm .seg°	m . hr.°
10	0,973	$13,66 \cdot 10^{-4}$	0,492
20	0,973	$14,06 \cdot 10^{-4}$	0,506
30	0,973	$14,35 \cdot 10^{-4}$	0,517
40	0,973	$14,62 \cdot 10^{-4}$	0,526
50	0,973	$14,87 \cdot 10^{-4}$	0,535
60	0,973	$15,10 \cdot 10^{-4}$	0,544



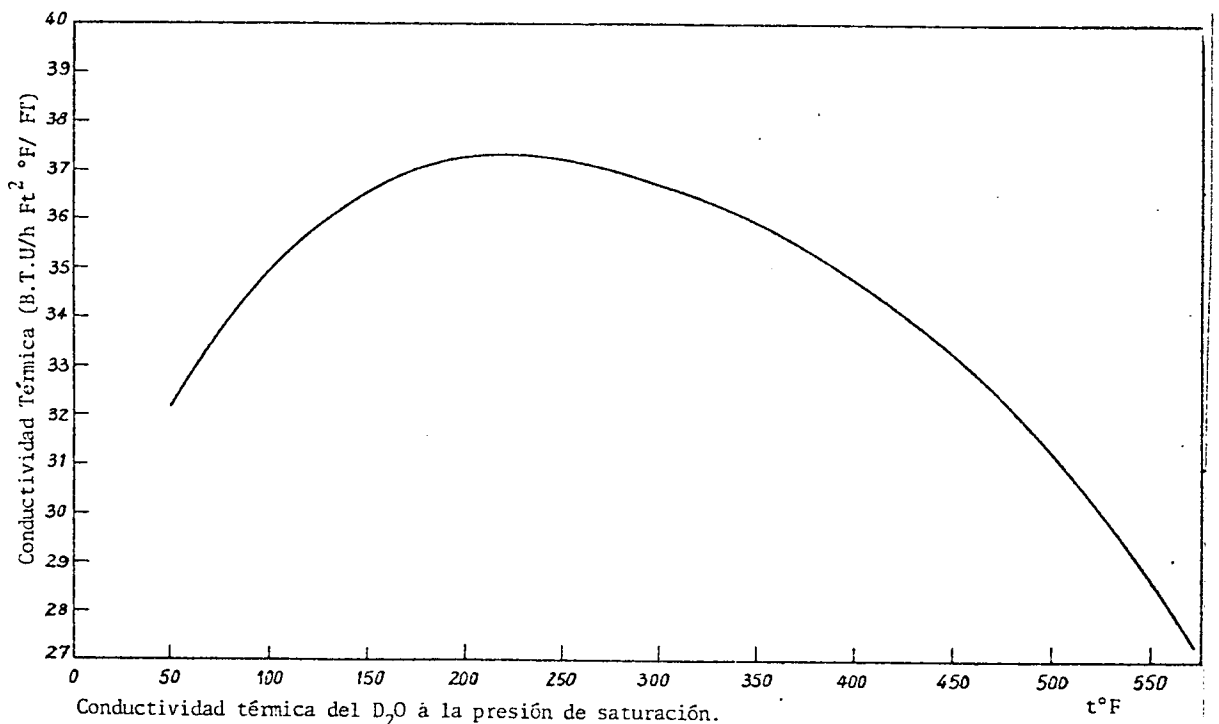
Conductividad térmica del D_2O .

13-p.18

RELACION DE CONDUCTIVIDADES
TERMICAS DEL D_2O Y H_2O

T (°C)	$\frac{K_{D_2O}}{K_{H_2O}}$
0	0,987
10	0,984
20	0,9806
30	0,9774
40	0,974
50	0,971
60	0,9676
70	0,9645
80	0,9613
90	0,958
100	0,955

13-p.18

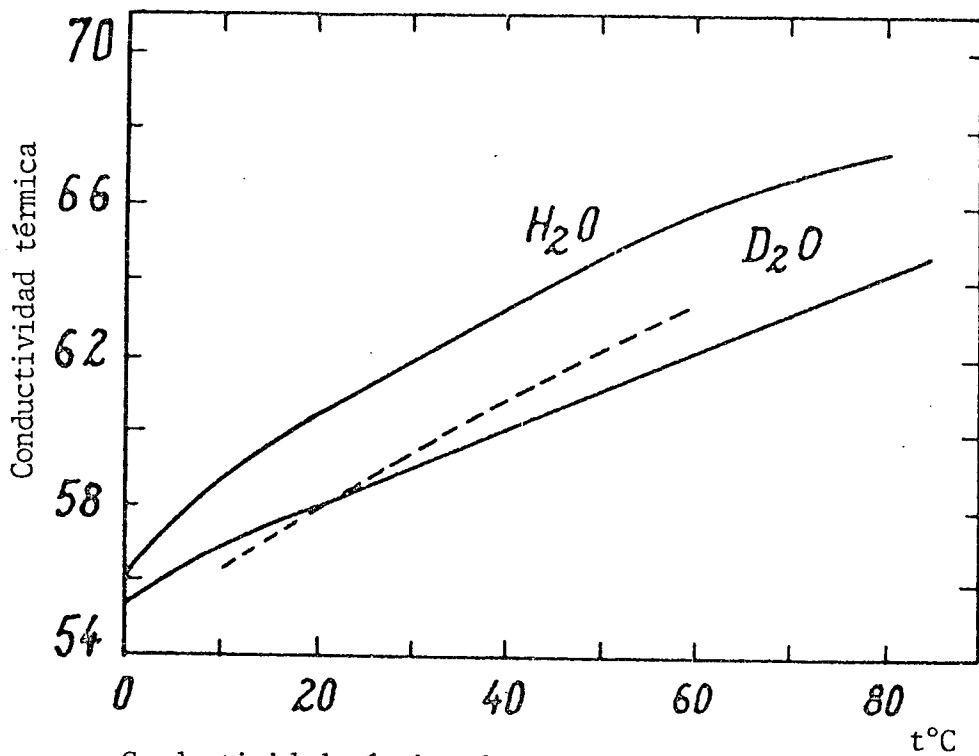


13-p.19

CONDUCTIVIDADES TERMICAS DEL H_2O Y D_2O (en $\text{joul.cm.cm}^{-2} \cdot \text{seg}^{-1} \cdot ^\circ\text{C}^{-1}$)

T($^\circ\text{C}$)	0	20	40	60	80
H_2O	0,00561	0,00604	0,00632	0,00657	0,00673
D_2O	0,00554	0,00579	0,00600	0,00620	0,00641

13-p.19



Conductividad térmica del D_2O y H_2O
(en $\text{joules cm. cm}^{-2} \cdot \text{seg}^{-1} \cdot ^\circ\text{C}^{-1} \times 10^4$)

Ref. ——— D_2O a 99,95 %.

----- D_2O a 95 % .

13-p.20

CONDUCTIVIDAD TERMICA DEL D₂O Y H₂O

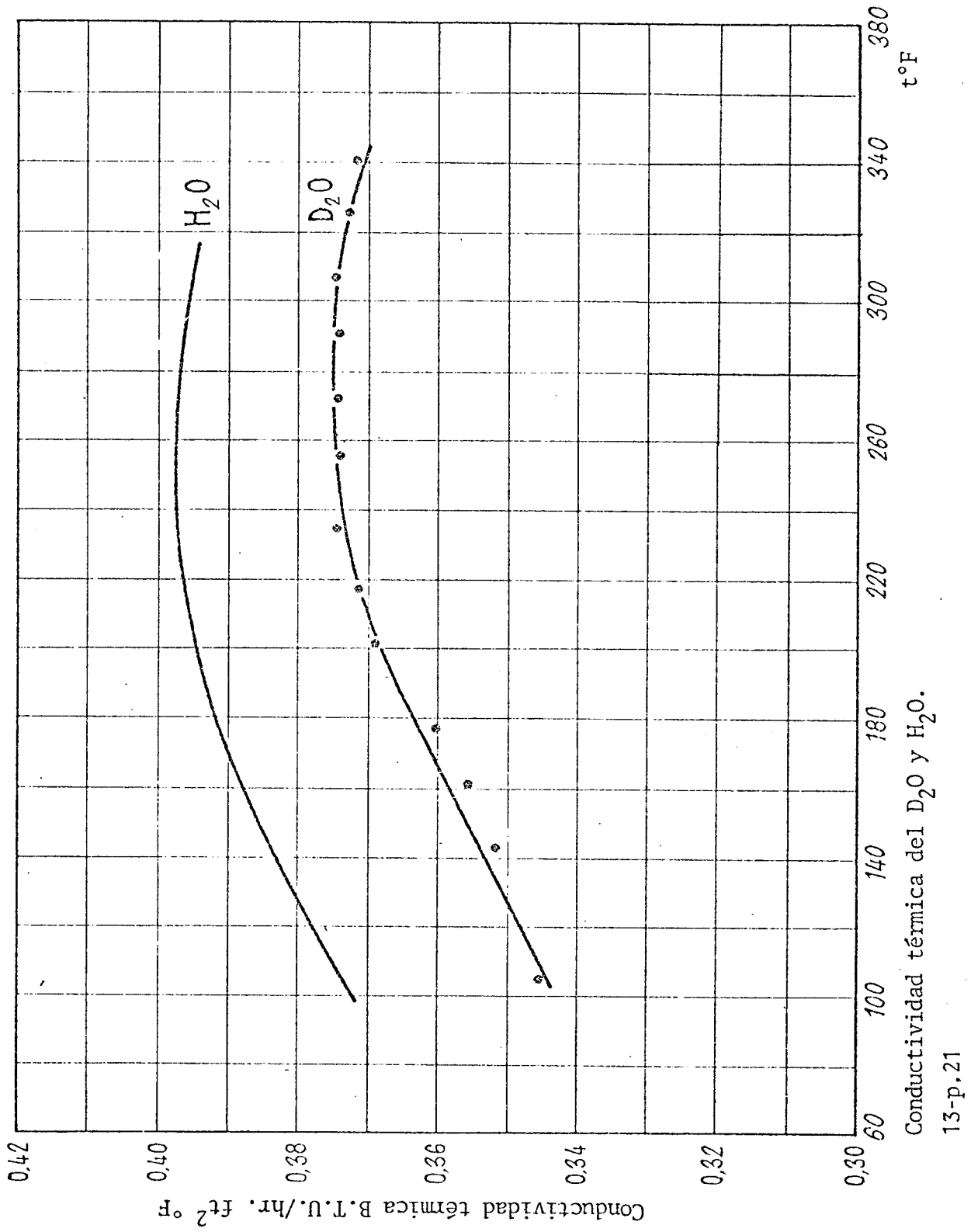
T (°F)	k _{D₂O}	k _{H₂O}
105,3	0,345	0,374
142,9	0,351	0,382
160,9	0,355	0,387
178,9	0,360	0,390
201,0	0,368	0,394
217,0	0,371	0,395
235,0	0,374	0,396
255,9	0,374	0,396
271,2	0,374	0,396
298,9	0,374	0,396
306,0	0,375	0,395
325,9	0,372	0,393
339,3	0,371	0,392

13-p.20

VALORES MEDIOS DE LA CONDUCTIVIDAD TERMICA DEL D₂O A LA PRESION DE SATURACION (kcal m⁻¹ h⁻¹ °C⁻¹)

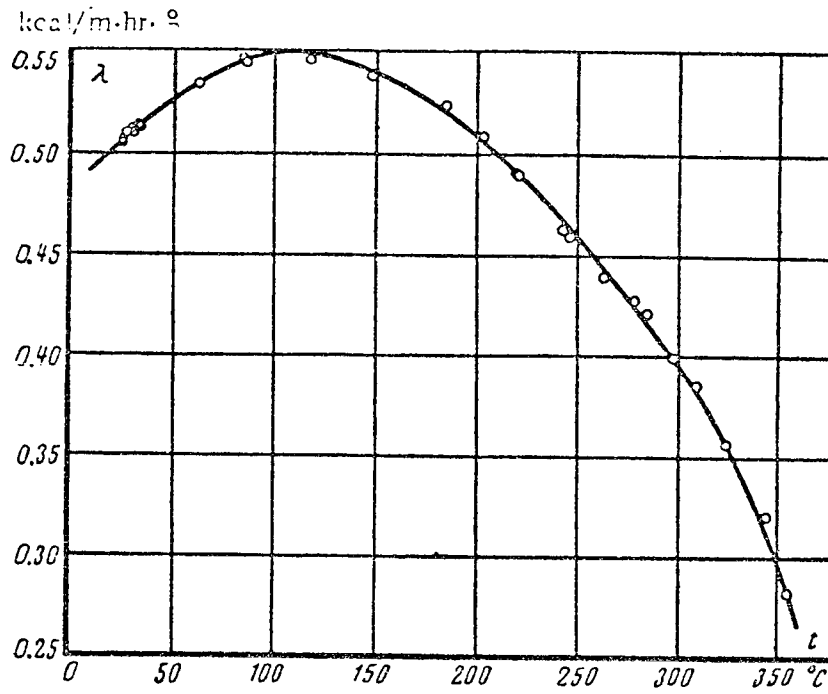
T (°C)	λ	T (°C)	λ	T (°C)	λ	T (°C)	λ
10	0,492	110	0,548	210	0,503	310	0,382
20	0,501	120	0,547	220	0,493	320	0,365
30	0,510	130	0,545	230	0,483	330	0,346
40	0,518	140	0,543	240	0,472	340	0,325
50	0,525	150	0,540	250	0,461	350	0,300
60	0,532	160	0,536	260	0,449	360	0,265
70	0,538	170	0,530	270	0,437		
80	0,543	180	0,524	280	0,424		
90	0,546	190	0,518	290	0,411		
100	0,548	200	0,511	300	0,397		

13-p.21



CONDUCTIVIDAD TERMICA DEL D₂O EN EQUILIBRIO CON
VAPOR SATURADO

P , kg/cm ²	Difer. de temp. en las paredes Δt , °C	Difer. de temp. en la capa del D ₂ O Δt D ₂ O, °C	Q , Kcal/h	λ , Kcal m.h. ²	$\bar{T}$, °C
1	1.16	7.87	0.8282	0.506	25.3
1	0.84	5.61	0.5909	0.507	25.5
1	0.86	5.84	0.6155	0.507	25.6
1	0.83	5.62	0.5930	0.507	26.0
1	0.86	5.76	0.6117	0.511	28.1
1	0.88	5.90	0.6281	0.512	28.8
1	1.17	7.87	0.8365	0.511	29.6
1	0.85	5.68	0.6032	0.511	29.8
1	1.19	7.92	0.8461	0.514	32.9
1	1.19	7.94	0.8470	0.513	34.3
1	1.20	7.92	0.8772	0.533	64.1
15	1.03	6.62	0.7510	0.546	85.9
15	1.38	8.94	1.0104	0.544	88.2
15	1.25	8.16	0.9269	0.546	118.7
17	1.26	8.50	0.9522	0.539	149.1
33	1.26	8.92	0.9732	0.524	185.7
33	1.26	9.25	0.9812	0.509	204.0
33	0.79	6.13	0.6258	0.490	220.4
33	1.24	9.62	0.9835	0.491	221.8
37	0.79	6.61	0.6364	0.463	243.6
37	0.94	7.88	0.7537	0.460	246.9
71	0.51	4.55	0.4187	0.441	264.4
67	0.52	4.83	0.4290	0.427	279.1
75	0.52	4.87	0.4277	0.422	286.4
114	0.54	5.32	0.4463	0.399	299.3
129	0.51	5.36	0.4343	0.385	310.3
133	0.44	5.04	0.3734	0.355	325.3
207	0.27	3.40	0.2393	0.319	344.3
208	0.11	1.52	0.0950	0.282	355.2



Conductividad térmica del D₂O

15-p.128

COEFICIENTE DE PRESION (a) DE LA CONDUCTIVIDAD TERMICA DEL D₂O.

$$a = \frac{1}{k} \left(\frac{\partial k}{\partial p} \right)_T$$

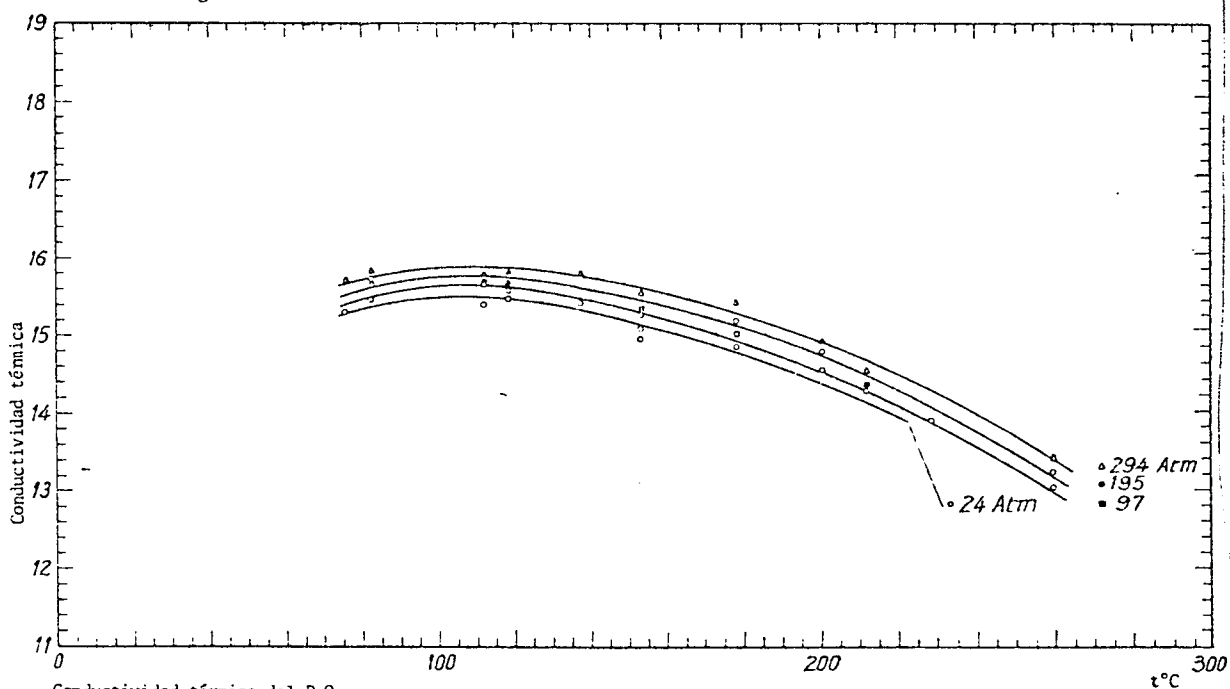
T(°C)	$a \times 10^4$ (atm ⁻¹)	T(°C)	$a \times 10^4$ (atm ⁻¹)
80	0.77	180	1.22
100	0.84	200	1.35
120	0.92	220	1.49
140	1.01	240	1.65
160	1.11	260	1.84

13-p.23

VALORES MEDIOS DE LA CONDUCTIVIDAD TERMICA DEL D₂O (10^{-4} cal cm⁻¹ °C⁻¹ seg⁻¹)

Presión (atm.)	Temperatura °C									
	80	100	120	140	160	180	200	220	240	260
100	15,52	15,66	15,60	15,43	15,20	14,91	14,53	14,09	13,53	12,91
200	15,64	15,79	15,74	15,59	15,36	15,09	14,73	14,29	13,75	13,15
300	15,76	15,93	15,89	15,74	15,53	15,27	14,92	14,50	13,97	13,38
400	15,87	16,06	16,03	15,90	15,70	15,45	15,11	14,71	14,19	13,61
500	15,99	16,20	16,17	16,05	15,86	15,63	15,31	14,91	14,41	13,85

13-p.22

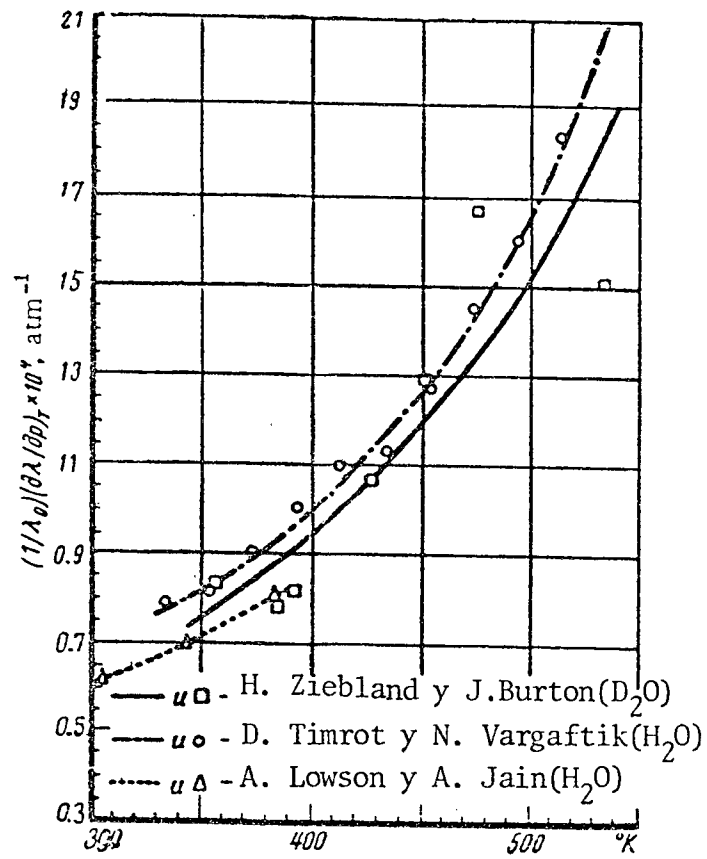
10⁻⁴ cal/cm. °C. seg

13-p.23

RELACION DE CONDUCTIVIDADES K_{H_2O} / K_{D_2O}

Presión atm	Temperatura (°C)									
	80	100	120	140	160	180	200	220	240	260
100	1,0453	1,0522	1,0611	1,0727	1,0839	1,0936	1,1047	1,1121	1,1230	1,1315
200	1,0463	1,0520	1,0621	1,0727	1,0830	1,0917	1,1015	1,1116	1,1253	1,1325
300	1,0450	1,0518	1,0631	1,0728	1,0839	1,0915	1,1040	1,1149	1,1275	1,1356
400	1,0482	1,0516	1,0640	1,0746	1,0848	1,0950	1,1064	1,1162	1,1297	1,1386
Valores medios	1,0462	1,0519	1,0626	1,0732	1,0839	1,0929	1,1041	1,1137	1,1264	1,1345
Diferencias	0,0012	0,0002	0,0011	0,0008	0,0006	0,0014	0,0018	0,0019	0,0025	0,0028

13-p.23



Coeficiente de presión de la conductividad térmica.

15-p.134

CONDUCTIVIDAD TERMICA DEL D₂O

$t, ^\circ\text{C}$	p, atm	λ		Nº de determi- naciones.	Desv. estandard cal/cm.seg.º 10-4
		cal/cm.seg. º .10 ⁻⁴	º kcal/m.hr.		
75.7	294	15.73	0.5663	5	0.031
75.8	24	15.31	0.5512	7	0.036
82.5	97	15.65	0.5634	6	0.056
82.5	195	15.74	0.5666	5	0.045
82.5	294	15.84	0.5702	6	0.054
85.6	24	15.48	0.5573	6	0.049
112.1	97	15.66	0.5638	5	0.024
112.2	24	15.42	0.5551	5	0.040
112.2	195	15.69	0.5648	6	0.029
112.2	294	15.79	0.5684	7	0.063
118.4	97	15.58	0.5609	7	0.038
118.4	195	15.68	0.5645	5	0.025
118.4	294	15.83	0.5699	6	0.057
118.5	24	15.48	0.5573	9	0.072
137.4	24	15.42	0.5551	6	0.086
137.4	294	15.81	0.5692	6	0.092
153.2	97	15.27	0.5497	4	0.089
153.3	24	15.09	0.5432	4	0.072
153.3	24	14.95	0.5382	7	0.055
153.3	195	15.35	0.5526	6	0.070
153.3	294	15.39	0.5540	6	0.053
153.3	294	15.55	0.5598	4	0.048
178.0	97	15.01	0.5404	5	0.044
178.0	97	15.15	0.5454	5	0.021
178.0	195	15.14	0.5450	7	0.054
178.1	24	14.85	0.5346	6	0.061
178.1	294	15.43	0.5555	6	0.141
200.6	195	14.79	0.5324	5	0.022
200.7	97	14.55	0.5238	6	0.044
200.7	294	14.92	0.5371	4	0.042
212.0	97	14.28	0.5141	8	0.047
212.0	195	14.36	0.5170	5	0.025
212.0	294	14.55	0.5238	6	0.045
228.6	97	13.89	0.5000	6	0.077
259.6	195	13.23	0.4763	5	0.040
259.6	294	13.42	0.4831	6	0.032
259.8	97	13.04	0.4694	5	0.034

CONDUCTIVIDAD TERMICA DEL AGUA LIVIANA

$\frac{T(^{\circ}\text{C})}{P(\text{atm.})}$	40°	60	80	100	120	150	200	300	T.Crítica.
Saturación	622,5	634,7	641,5	642,0	639,0	628,3	595,2	486,7	370,5
100	626,5	639,0	644,7	646,2	644,5	634,2	602,0	489,0	-
200	632	644,4	650,2	652,0	650,5	640,1	609,8	503,2	-
500	649,4	660,5	666,5	668,5	667,0	660,0	633,0	541,5	444,0
1 000	678	687,5	693,3	696,2	694,5	689,0	670,5	-	-

Conductividad térmica ($\lambda \times 10^{-3}$ Watt/ m. $^{\circ}\text{C}$)

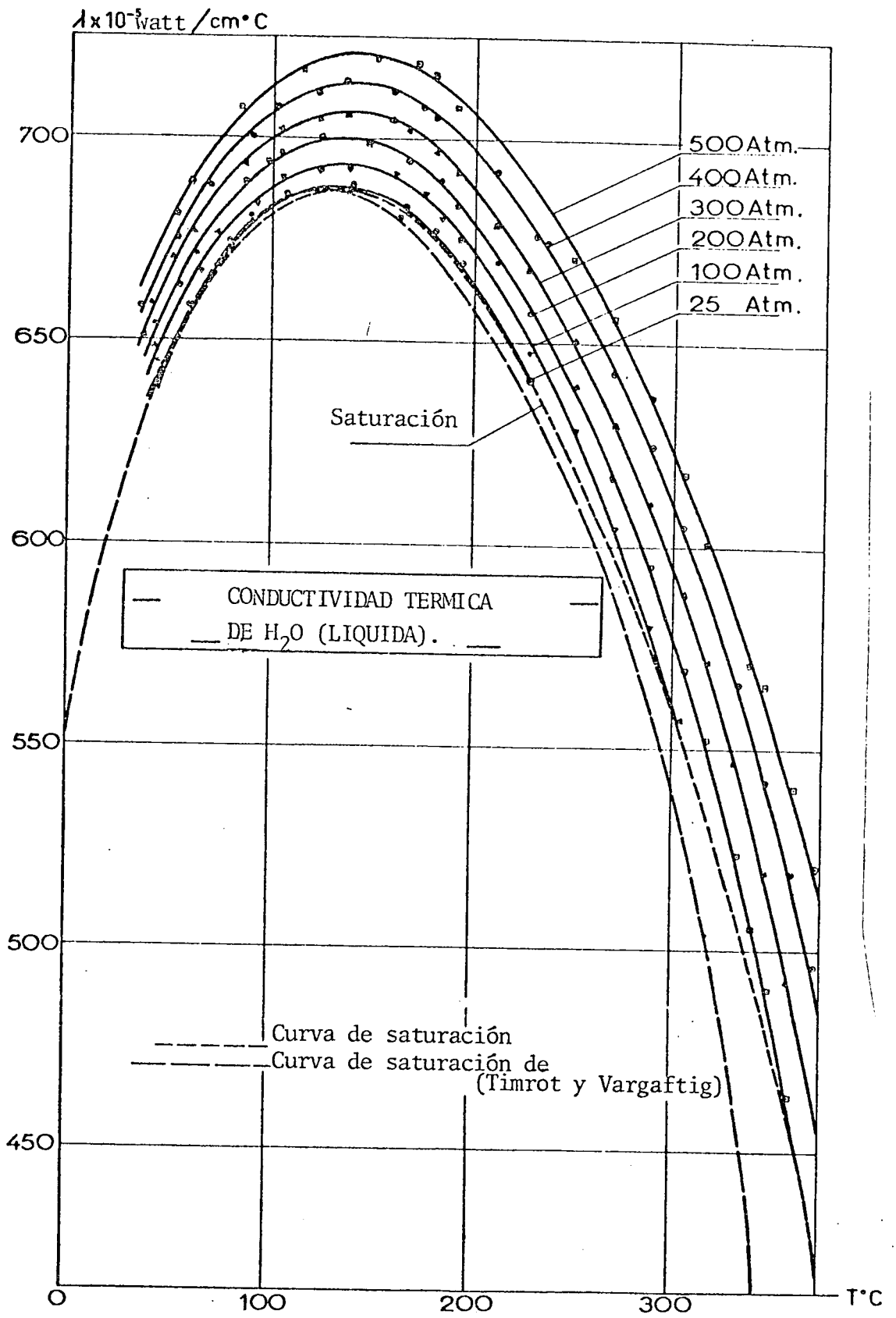
13-p.24

CONDUCTIVIDAD TERMICA DEL AGUA PESADA

$\frac{T(^{\circ}\text{C})}{P(\text{atm.})}$	40	60	80	100	120	150	200	300	T. Crítica
Saturación.	635,5	657,0	671,7	680,7	685,3	686,2	664,5	557,4	421,0
100	641,5	664,0	678,5	687,2	692,5	692,2	672,0	561,2	-
200	648,0	670,0	684,5	693,5	698,8	699,5	680,2	578,4	-
500	668,3	688,5	703,0	712,5	719,0	720,6	705,5	623,2	413,5

Conductividad térmica ($\lambda \times 10^{-3}$ Watt/ m. $^{\circ}\text{C}$)

13-p.24



CONDUCTIVIDAD TERMICA DEL D₂O EN Kcal/m.h.^º

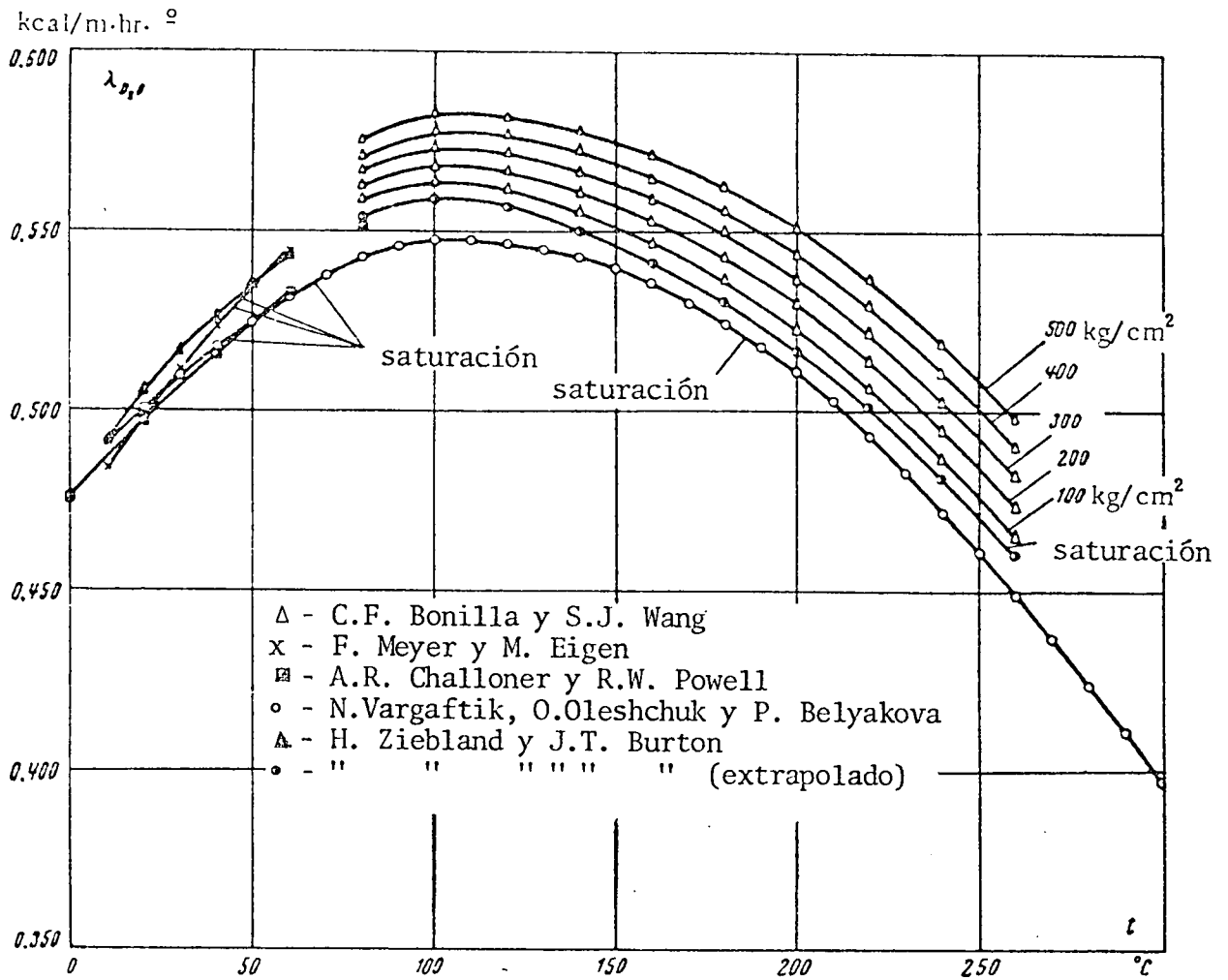
t, °C	λ_s	$\rho, \text{kg/cm}^2$				
		100	200	300	400	500
3.8	0.481	0.486	0.490	0.495	0.500	0.504
10	0.488	0.492	0.496	0.501	0.506	0.511
20	0.498	0.502	0.507	0.512	0.516	0.521
30	0.508	0.512	0.517	0.522	0.526	0.531
40	0.518	0.522	0.526	0.531	0.535	0.540
50	0.527	0.531	0.535	0.540	0.544	0.548
60	0.535	0.539	0.543	0.548	0.552	0.556
70	0.542	0.546	0.550	0.555	0.559	0.563
80	0.548	0.552	0.557	0.561	0.565	0.569
90	0.552	0.556	0.561	0.566	0.570	0.575
100	0.554	0.558	0.563	0.568	0.573	0.578
110	0.554	0.558	0.563	0.568	0.573	0.578
120	0.552	0.557	0.562	0.567	0.572	0.577
130	0.550	0.555	0.560	0.565	0.571	0.576
140	0.547	0.552	0.558	0.563	0.569	0.574
150	0.543	0.549	0.555	0.560	0.566	0.572
160	0.539	0.545	0.551	0.557	0.563	0.569
170	0.534	0.540	0.546	0.552	0.559	0.565
180	0.528	0.534	0.540	0.547	0.554	0.560
190	0.521	0.527	0.534	0.541	0.548	0.554
200	0.514	0.520	0.527	0.534	0.541	0.548
210	0.506	0.512	0.519	0.526	0.533	0.541
220	0.497	0.503	0.510	0.518	0.515	0.533
230	0.487	0.493	0.500	0.508	0.516	0.524
240	0.477	0.482	0.490	0.498	0.506	0.514
250	0.466	0.471	0.479	0.487	0.495	0.503
260	0.455	0.459	0.467	0.476	0.484	0.492

15-p.136

DATOS DE CONDUCTIVIDAD TERMICA DEL AGUA PESADA

t, °C	λ		t, °C	λ	
	cal	kcal		cal	kcal
	cm.seg. ^º	m.hr. ^º		cm.seg. ^º	m.hr. ^º
10	$13.4_3 \cdot 10^{-4}$	0.484	40	$14.5_3 \cdot 10^{-4}$	0.524
20	$13.8_3 \cdot 10^{-4}$	0.499	50	$14.9_6 \cdot 10^{-4}$	0.535
30	$14.1_9 \cdot 10^{-4}$	0.512	60	$15.1_1 \cdot 10^{-4}$	0.545

15-p.124



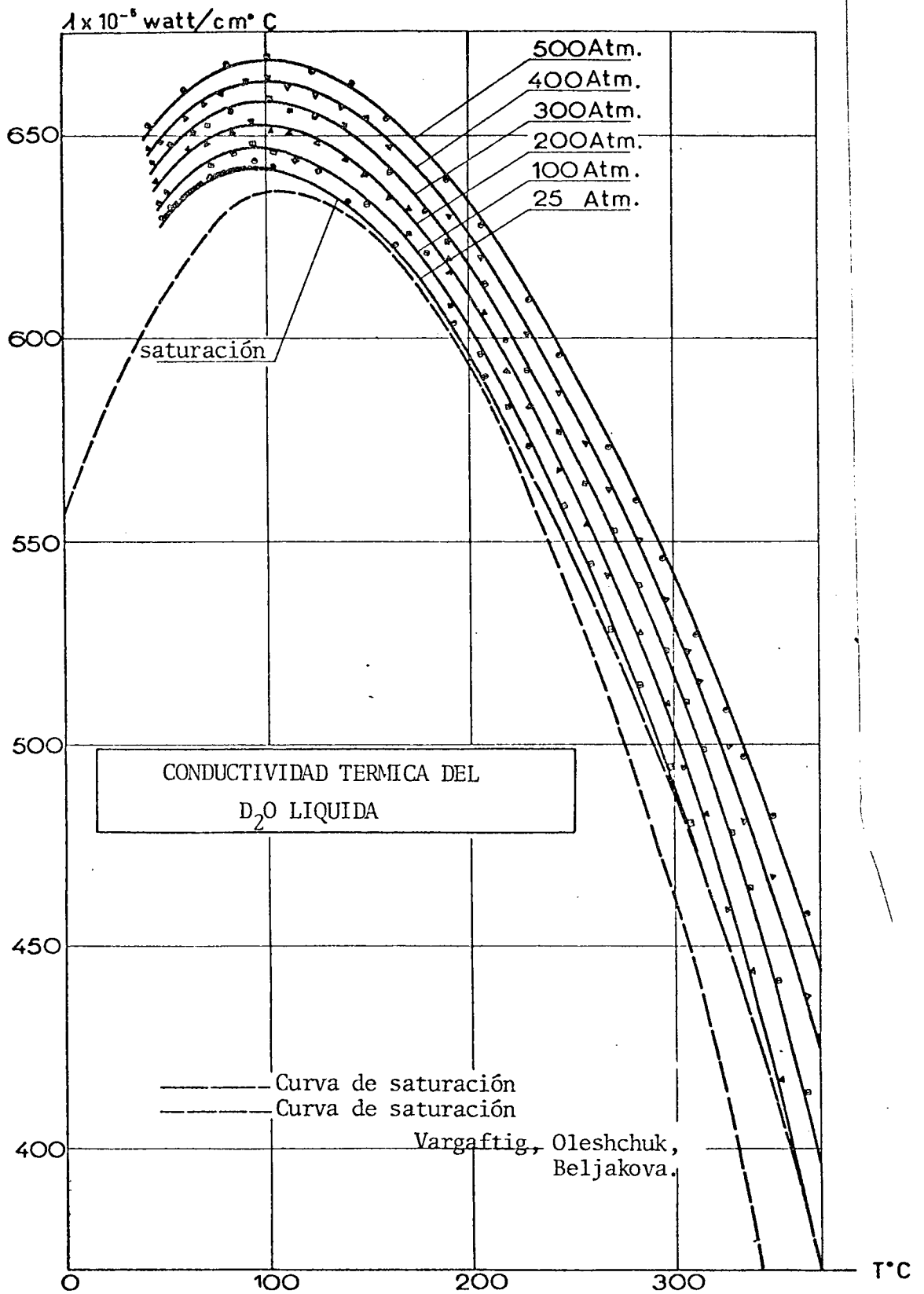
Conductividad térmica del D₂O.

15-p.136

CONDUCTIVIDAD TERMICA DEL D₂O

T °C	λ D ₂ O	
	joules	kcal
	cm.sec.°	m.hr.°
0	0.00554	0.476
20	0.00579	0.498
40	0.00600	0.516
60	0.00620	0.533
80	0.00641	0.551

15-p.125



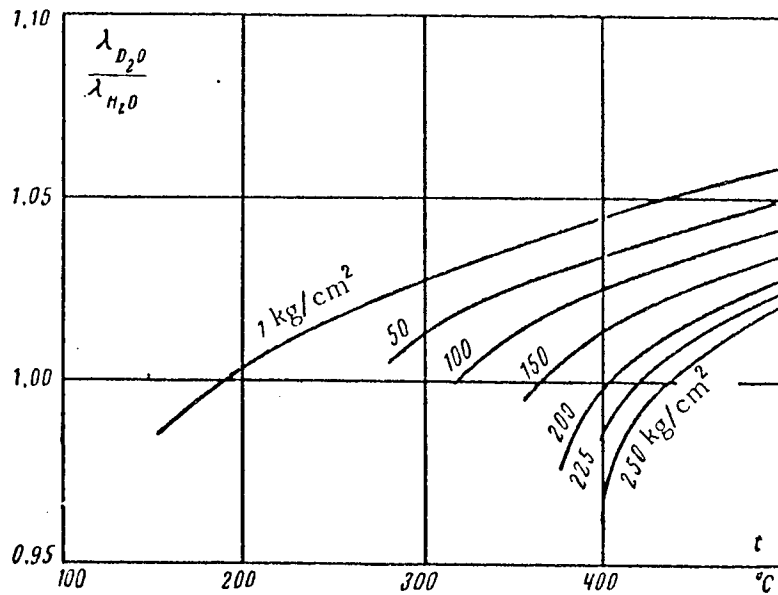
DATOS EXPERIMENTALES DE CONDUCTIVIDAD TERMICA
DEL D_2O_{gas} ; $\lambda \cdot 10^4$ (Kcal/mol h °)

$t, ^\circ\text{C}$	$\Delta t, ^\circ\text{C}$	λ	$t, ^\circ\text{C}$	$\Delta t, ^\circ\text{C}$	λ	$t, ^\circ\text{C}$	$\Delta t, ^\circ\text{C}$	λ
$p=1 \text{ kg/cm}^2$			418.8	22.99	556	$p=200 \text{ kg/cm}^2$		
144.6	21.27	248	422.8	17.69	553	379.5	1.31	1 060
160.4	12.89	262	433.5	23.17	574	380.5	2.32	1 045
168.7	21.23	266	455.9	15.80	593	382.9	2.40	1 014
194.0	20.56	285	448.7	9.06	589	387.3	2.53	966
222.5	19.72	310	454.7	16.75	589	390.5	4.43	949
231.6	20.50	319	501.7	4.52	661	417.6	5.95	827
256.7	18.25	341	504.1	7.78	657	426.7	12.79	820
275.5	6.70	363	$p=100 \text{ kg/cm}^2$			441.7	6.99	809
281.3	11.70	365	313.2	5.40	676	448.6	13.24	807
292.2	17.30	375	319.0	9.91	648	460.8	6.55	793
317.4	14.29	405	347.0	21.08	579	466.1	14.90	786
351.5	15.79	437	356.7	16.49	580	498.4	6.47	802
357.7	14.50	451	370.4	21.45	579	$p=225 \text{ kg/cm}^2$		
383.7	11.16	475	387.6	15.22	580	389.4	1.89	1 258
389.1	13.63	487	403.5	21.60	588	393.9	1.73	1 160
393.0	21.00	486	414.1	8.89	590	399.8	3.28	1 056
400.5	14.52	493	420.7	16.47	598	404.8	2.25	1 049
415.9	10.13	518	447.3	8.59	623	409.5	3.58	988
423.8	18.75	518	453.7	15.92	622	411.3	5.08	996
427.0	13.87	526	458.5	6.35	647	416.7	3.00	972
449.5	9.49	562	464.9	14.03	652	430.8	12.83	902
455.3	17.68	568	499.3	4.33	690	440.8	6.06	873
$p=50 \text{ kg/cm}^2$			501.2	7.50	680	446.8	14.61	871
271.3	8.93	475	$p=150 \text{ kg/cm}^2$			459.1	6.07	855
281.5	9.30	462	346.1	3.59	912	465.5	13.90	841
282.1	13.45	465	351.1	10.94	873	492.1	3.59	844
291.8	24.10	464	360.9	12.13	807	495.1	6.20	836
304.6	13.40	466	376.6	13.57	735	$p=250 \text{ kg/cm}^2$		
313.3	24.69	462	380.6	18.61	728	399.0	1.22	1 344
320.5	34.56	460	382.6	13.82	715	403.6	1.30	1 292
334.3	12.97	470	393.4	24.91	712	404.6	1.98	1 228
343.7	25.39	479	395.3	15.83	707	407.3	2.09	1 193
356.5	13.25	493	409.8	7.66	683	416.7	2.77	1 109
369.3	24.60	502	415.4	14.47	672	419.2	2.32	1 089
380.7	10.32	508	418.8	16.60	685	429.1	2.88	1 006
387.4	12.84	516	453.8	7.73	697	444.4	3.10	945
389.5	19.42	520	458.9	14.27	697	459.9	3.29	909
393.9	23.92	525	495.3	4.04	735	488.5	3.38	895
415.8	9.53	550	497.7	6.96	726	490.7	5.73	897

COMPARACION DE CONDUCTIVIDAD TERMICA DEL D₂O EN EQUILIBRIO
CON VAPOR SATURADO

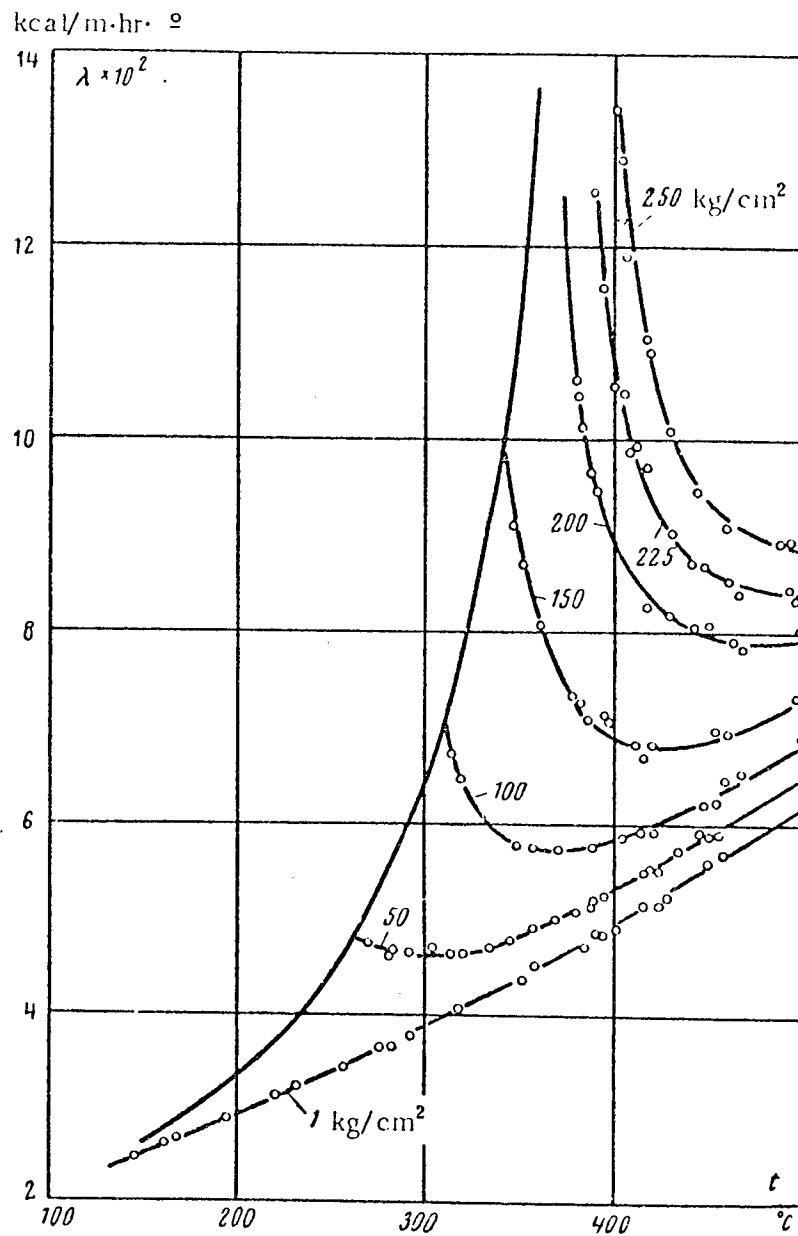
$\lambda_{D_2O},$ kcal/m-hr [°]				$\lambda_{D_2O},$ kcal/m-hr [°]			
t, °C	Vargaftik, Oleshchuk, Belyakova	Ziebland Burton	$\delta, \%$	t, °C	Vargaftik, Oleshchuk, Belyakova	Ziebland Burton	$\delta, \%$
80	0.543	0.554	2.0	180	0.524	0.531	1.3
100	0.548	0.559	2.0	200	0.511	0.517	1.2
120	0.547	0.557	1.8	220	0.493	0.502	1.8
140	0.543	0.550	1.3	240	0.472	0.482	2.1
160	0.536	0.542	1.1	260	0.449	0.460	2.4

15-p.135



Relación de conductividades del vapor de agua pesada y liviana.

15-p.138



Datos experimentales de conductividad térmica
del D₂O

15-p.138

RELACION DE CONDUCTIVIDADES DEL H₂O Y D₂O
(en fase gaseosa)

t, °C	ρ, kg/cm ³						
	1	50	100	150	200	225	250
150	0.985	—	—	—	—	—	—
160	0.989	—	—	—	—	—	—
180	0.997	—	—	—	—	—	—
200	1.003	—	—	—	—	—	—
220	1.008	—	—	—	—	—	—
240	1.013	—	—	—	—	—	—
260	1.018	—	—	—	—	—	—
280	1.022	1.003	—	—	—	—	—
300	1.026	1.012	—	—	—	—	—
320	1.030	1.018	0.997	—	—	—	—
340	1.034	1.022	1.008	—	—	—	—
360	1.038	1.026	1.015	0.997	—	—	—
380	1.041	1.030	1.020	1.005	0.975	—	—
400	1.044	1.034	1.024	1.012	0.997	0.982	0.965
420	1.047	1.037	1.028	1.019	1.006	0.999	0.990
440	1.050	1.041	1.032	1.023	1.013	1.007	1.001
460	1.052	1.043	1.035	1.027	1.019	1.014	1.008
480	1.054	1.046	1.038	1.031	1.024	1.018	1.015
500	1.056	1.048	1.041	1.034	1.027	1.023	1.021

15-p.139

CONDUCTIVIDAD TERMICA DEL AGUA Y DEL VAPOR

Temp. °F Presión Agua Sat. Vapor Sat.	k, (Btu/hr × ft. × F) × 10 ³												
	1	2	5	10	20	50	100	200	500	1000	2000	5000	7500
364.0	11.6	373.1	383.8	390.4	395.2	397.4	394.7	386.2	361.7	327.6	271.8	—	—
11.6	12.2	13.0	13.8	14.8	16.6	18.4	21.1	27.2	36.5	61.3	—	—	—
1500	63.7	63.7	63.7	63.7	63.7	63.8	64.0	64.3	65.4	67.1	70.7	82.0	92.2
1450	61.4	61.4	61.5	61.5	61.5	61.6	61.8	62.1	63.2	64.9	68.5	80.1	90.6
1400	59.2	59.2	59.2	59.2	59.3	59.4	59.6	59.9	60.9	62.7	66.3	78.2	89.2
1350	57.0	57.0	57.0	57.0	57.1	57.2	57.3	57.7	58.7	60.5	64.2	76.3	87.9
1300	54.8	54.8	54.8	54.8	54.8	54.9	55.1	55.5	56.5	58.3	62.0	74.6	86.9
1250	52.6	52.6	52.6	52.6	52.6	52.7	52.9	53.2	54.3	56.1	59.9	73.0	86.3
1200	50.4	50.4	50.4	50.4	50.4	50.5	50.7	51.0	52.1	53.9	57.8	71.6	86.2
1150	48.2	48.2	48.2	48.2	48.2	48.3	48.5	48.9	49.9	51.8	55.7	70.5	87.0
1100	46.0	46.0	46.0	46.0	46.1	46.2	46.3	46.7	47.8	49.6	53.7	69.8	89.0
1050	43.9	43.9	43.9	43.9	43.9	44.0	44.2	44.6	45.6	47.5	51.8	69.7	93.4
1000	41.7	41.7	41.8	41.8	41.8	41.9	42.1	42.4	43.5	45.5	50.0	70.7	102.9
950	39.6	39.6	39.7	39.7	39.7	39.8	40.0	40.3	41.4	43.5	48.3	73.5	115.5
900	37.6	37.6	37.6	37.6	37.6	37.7	37.9	38.3	39.4	41.5	46.8	80.2	138.7
850	35.5	35.6	35.6	35.6	35.6	35.7	35.9	36.3	37.4	39.7	45.6	96.7	178.8
800	33.6	33.6	33.6	33.6	33.6	33.7	33.9	34.3	35.5	37.9	44.9	129.6	223.2
750	31.6	31.6	31.6	31.6	31.7	31.8	32.0	32.3	33.6	36.3	45.2	202.5	258.3
700	29.7	29.7	29.7	29.7	29.8	29.9	30.1	30.4	31.8	35.0	47.5	262.8	295.1
650	27.8	27.8	27.9	27.9	27.9	28.0	28.2	28.6	30.1	34.1	55.7	304.3	326.7
600	26.0	26.0	26.1	26.1	26.1	26.2	26.4	26.9	28.7	34.1	50.9	333.7	349.3
550	24.3	24.3	24.3	24.3	24.4	24.5	24.7	25.2	27.5	36.1	333.7	356.1	368.0
500	22.6	22.6	22.6	22.6	22.7	22.8	23.0	23.6	25.9	350.8	357.4	373.8	383.6
450	21.0	21.0	21.0	21.0	21.0	21.2	21.4	22.3	25.1	370.6	375.3	387.9	396.5
400	19.4	19.4	19.4	19.4	19.5	19.6	20.0	21.3	25.0	384.9	388.5	398.6	406.4
350	17.9	17.9	17.9	17.9	18.0	18.2	18.8	20.2	302.9	394.4	397.4	406.1	413.2
300	16.5	16.5	16.5	16.5	16.6	16.9	17.8	19.7	307.2	398.0	399.3	409.9	416.4
250	15.1	15.1	15.1	15.2	15.3	15.9	17.0	19.7	307.0	397.3	398.1	409.7	415.8
200	13.8	13.8	13.9	14.0	14.1	15.6	17.1	19.8	307.6	397.1	397.4	409.9	416.4
150	12.7	12.7	13.0	13.3	13.6	15.0	16.6	19.3	307.3	396.9	397.1	409.7	415.8
100	11.6	11.6	11.9	12.2	12.5	13.9	15.6	18.3	307.0	396.6	396.8	409.7	415.8
50	10.5	10.5	10.8	11.1	11.4	12.9	14.6	17.3	306.7	396.3	396.5	409.7	415.8
32	9.4	9.4	9.7	10.0	10.3	11.8	13.5	16.2	306.4	396.0	396.2	409.7	415.8

14-p. E-20

λ Conductividad del D₂O :J/m s°K
Presión en bars

°C	5at.	50	100	150	200	250	300
10	.5646	.5662	.5678	.5693	.5709	.5725	.5741
11	.5664	.5680	.5695	.5712	.5726	.5744	.5759
12	.5682	.5698	.5714	.5730	.5746	.5762	.5778
13	.5700	.5716	.5732	.5748	.5764	.5780	.5797
14	.5717	.5734	.5750	.5766	.5782	.5798	.5815
15	.5735	.5751	.5767	.5784	.5800	.5816	.5833
16	.5751	.5768	.5784	.5801	.5817	.5834	.5850
17	.5768	.5785	.5801	.5818	.5835	.5851	.5868
18	.5785	.5801	.5818	.5835	.5851	.5868	.5885
19	.5801	.5818	.5835	.5851	.5868	.5885	.5902
20	.5817	.5834	.5851	.5868	.5885	.5902	.5919
21	.5833	.5850	.5867	.5884	.5901	.5918	.5935
22	.5848	.5865	.5882	.5900	.5917	.5934	.5951
23	.5863	.5881	.5898	.5915	.5933	.5950	.5967
24	.5878	.5896	.5913	.5931	.5948	.5965	.5983
25	.5893	.5911	.5928	.5946	.5963	.5981	.5999
26	.5908	.5925	.5943	.5961	.5978	.5996	.6014
27	.5922	.5940	.5958	.5975	.5993	.6011	.6029
28	.5936	.5954	.5972	.5990	.6008	.6026	.6044
29	.5950	.5968	.5986	.6004	.6022	.6040	.6058
30	.5964	.5982	.6000	.6018	.6036	.6055	.6073
31	.5977	.5995	.6014	.6032	.6050	.6069	.6087
32	.5990	.6009	.6027	.6046	.6064	.6082	.6101
33	.6003	.6022	.6040	.6059	.6077	.6096	.6115
34	.6016	.6035	.6053	.6072	.6091	.6109	.6128
35	.6029	.6047	.6066	.6085	.6104	.6122	.6141
36	.6041	.6060	.6079	.6098	.6117	.6135	.6154
37	.6053	.6072	.6091	.6110	.6129	.6148	.6167
38	.6065	.6084	.6103	.6122	.6142	.6161	.6180
39	.6077	.6096	.6115	.6134	.6154	.6173	.6192
40	.6088	.6107	.6127	.6146	.6166	.6185	.6205
41	.6099	.6119	.6138	.6158	.6177	.6197	.6217
42	.6110	.6130	.6150	.6169	.6189	.6209	.6229
43	.6121	.6141	.6161	.6181	.6200	.6220	.6240
44	.6132	.6152	.6172	.6192	.6212	.6231	.6251
45	.6142	.6162	.6182	.6202	.6222	.6242	.6263
46	.6153	.6173	.6193	.6213	.6233	.6253	.6273
47	.6163	.6183	.6203	.6223	.6244	.6264	.6284
48	.6173	.6193	.6213	.6234	.6254	.6274	.6295
49	.6182	.6203	.6223	.6244	.6264	.6285	.6305
50	.6192	.6212	.6233	.6254	.6274	.6295	.6315
51	.6201	.6222	.6242	.6263	.6284	.6305	.6325
52	.6210	.6231	.6252	.6273	.6294	.6314	.6335
53	.6219	.6240	.6261	.6282	.6303	.6324	.6345
54	.6228	.6249	.6270	.6291	.6312	.6333	.6354
55	.6236	.6257	.6279	.6300	.6321	.6342	.6364
56	.6244	.6266	.6287	.6309	.6330	.6351	.6373
57	.6253	.6274	.6296	.6317	.6338	.6359	.6381
58	.6261	.6282	.6304	.6325	.6347	.6369	.6390
59	.6268	.6290	.6312	.6333	.6355	.6377	.6399

λ Conductividad del D₂O :J/m s°K
Presión en bars

°C	Sat.	50	100	150	200	250	300
60	.6276	.6298	.6320	.6341	.6363	.6385	.6407
61	.6283	.6305	.6327	.6349	.6371	.6393	.6415
62	.6290	.6313	.6335	.6357	.6379	.6401	.6423
63	.6298	.6320	.6342	.6364	.6386	.6409	.6431
64	.6304	.6327	.6349	.6371	.6394	.6416	.6438
65	.6311	.6333	.6356	.6378	.6401	.6423	.6446
66	.6318	.6340	.6363	.6385	.6408	.6430	.6453
67	.6324	.6347	.6369	.6392	.6415	.6437	.6460
68	.6330	.6353	.6376	.6399	.6421	.6444	.6467
69	.6335	.6359	.6382	.6405	.6428	.6451	.6474
70	.6342	.6365	.6388	.6411	.6434	.6457	.6480
71	.6348	.6371	.6394	.6417	.6440	.6463	.6487
72	.6353	.6376	.6400	.6423	.6446	.6470	.6493
73	.6358	.6382	.6405	.6429	.6452	.6476	.6499
74	.6364	.6387	.6411	.6434	.6458	.6481	.6505
75	.6369	.6392	.6416	.6439	.6463	.6487	.6511
76	.6373	.6397	.6421	.6445	.6468	.6492	.6516
77	.6378	.6402	.6426	.6450	.6474	.6498	.6522
78	.6382	.6406	.6430	.6455	.6479	.6503	.6527
79	.6387	.6411	.6435	.6459	.6483	.6508	.6532
80	.6391	.6415	.6439	.6464	.6488	.6512	.6537
81	.6395	.6419	.6444	.6468	.6493	.6517	.6542
82	.6399	.6423	.6448	.6472	.6497	.6522	.6546
83	.6403	.6427	.6452	.6476	.6501	.6526	.6551
84	.6406	.6431	.6456	.6480	.6505	.6530	.6555
85	.6410	.6434	.6459	.6484	.6509	.6534	.6559
86	.6413	.6438	.6463	.6488	.6513	.6538	.6563
87	.6416	.6441	.6466	.6491	.6516	.6542	.6567
88	.6419	.6444	.6469	.6495	.6520	.6545	.6570
89	.6422	.6447	.6472	.6498	.6523	.6549	.6574
90	.6424	.6450	.6475	.6501	.6526	.6552	.6577
91	.6427	.6452	.6478	.6504	.6529	.6555	.6581
92	.6429	.6455	.6480	.6506	.6532	.6558	.6584
93	.6431	.6457	.6483	.6509	.6535	.6561	.6587
94	.6434	.6459	.6485	.6511	.6537	.6563	.6589
95	.6435	.6461	.6487	.6514	.6540	.6566	.6592
96	.6437	.6463	.6489	.6516	.6542	.6568	.6595
97	.6439	.6465	.6491	.6518	.6544	.6571	.6597
98	.6440	.6466	.6493	.6520	.6546	.6573	.6599
99	.6442	.6468	.6495	.6521	.6548	.6575	.6601
100	.6443	.6469	.6496	.6523	.6550	.6576	.6603
101	.6444	.6470	.6497	.6524	.6551	.6578	.6605
102	.6445	.6472	.6499	.6526	.6553	.6580	.6607
103	.6446	.6472	.6500	.6527	.6554	.6581	.6608
104	.6447	.6473	.6501	.6528	.6555	.6582	.6610
105	.6447	.6474	.6501	.6529	.6556	.6584	.6611
106	.6448	.6474	.6502	.6530	.6557	.6585	.6612
107	.6448	.6475	.6502	.6530	.6558	.6586	.6613
108	.6448	.6475	.6503	.6531	.6558	.6586	.6614
109	.6448	.6475	.6503	.6531	.6559	.6587	.6615

λ Conductividad del D₂O :J/m s°K
Presión en bars

°C	Sat.	50	100	150	200	250	300
110	.6448	.6475	.6503	.6531	.6559	.6587	.6615
111	.6448	.6475	.6503	.6531	.6560	.6588	.6616
112	.6447	.6475	.6503	.6531	.6560	.6588	.6616
113	.6447	.6474	.6503	.6531	.6560	.6588	.6617
114	.6446	.6474	.6502	.6531	.6560	.6588	.6617
115	.6446	.6473	.6502	.6531	.6559	.6588	.6617
116	.6445	.6473	.6501	.6530	.6559	.6588	.6616
117	.6444	.6472	.6501	.6529	.6558	.6587	.6616
118	.6443	.6471	.6500	.6529	.6558	.6587	.6616
119	.6441	.6469	.6499	.6528	.6557	.6586	.6615
120	.6440	.6468	.6497	.6527	.6556	.6585	.6615
121	.6439	.6467	.6495	.6526	.6555	.6585	.6614
122	.6437	.6465	.6495	.6524	.6554	.6584	.6613
123	.6435	.6464	.6493	.6523	.6553	.6582	.6612
124	.6433	.6462	.6492	.6522	.6551	.6581	.6611
125	.6432	.6460	.6490	.6520	.6550	.6580	.6610
126	.6430	.6458	.6488	.6518	.6548	.6578	.6608
127	.6427	.6456	.6486	.6516	.6547	.6577	.6607
128	.6425	.6454	.6484	.6514	.6545	.6575	.6605
129	.6423	.6452	.6482	.6512	.6543	.6573	.6604
130	.6420	.6449	.6480	.6510	.6541	.6571	.6602
131	.6418	.6447	.6477	.6508	.6539	.6569	.6600
132	.6415	.6444	.6475	.6506	.6536	.6567	.6598
133	.6412	.6441	.6472	.6503	.6534	.6565	.6596
134	.6409	.6438	.6469	.6500	.6531	.6563	.6594
135	.6406	.6435	.6466	.6497	.6529	.6560	.6591
136	.6403	.6432	.6463	.6495	.6526	.6557	.6589
137	.6400	.6429	.6460	.6492	.6523	.6555	.6586
138	.6396	.6426	.6457	.6489	.6520	.6552	.6583
139	.6393	.6422	.6454	.6485	.6517	.6549	.6581
140	.6389	.6419	.6450	.6482	.6514	.6546	.6578
141	.6385	.6415	.6447	.6479	.6511	.6543	.6575
142	.6382	.6411	.6443	.6475	.6507	.6540	.6572
143	.6378	.6407	.6440	.6472	.6504	.6536	.6568
144	.6374	.6403	.6435	.6468	.6500	.6533	.6565
145	.6369	.6399	.6432	.6464	.6497	.6529	.6562
146	.6365	.6395	.6428	.6460	.6493	.6526	.6558
147	.6361	.6391	.6424	.6456	.6489	.6522	.6554
148	.6357	.6386	.6419	.6452	.6485	.6518	.6551
149	.6352	.6382	.6415	.6448	.6481	.6514	.6547
150	.6347	.6377	.6410	.6444	.6477	.6510	.6543
151	.6343	.6373	.6406	.6439	.6472	.6506	.6539
152	.6338	.6368	.6401	.6435	.6468	.6501	.6535
153	.6333	.6363	.6396	.6430	.6463	.6497	.6530
154	.6328	.6358	.6392	.6425	.6459	.6492	.6526
155	.6323	.6353	.6387	.6420	.6454	.6488	.6522
156	.6317	.6348	.6382	.6415	.6449	.6483	.6517
157	.6312	.6342	.6376	.6410	.6444	.6478	.6512
158	.6307	.6337	.6371	.6405	.6439	.6474	.6508
159	.6301	.6331	.6365	.6400	.6434	.6469	.6503

λ Conductividad del D_2O :J/m s°K
Presión en bars

°C	Sat.	50	100	150	200	250	300
160	.6295	.6326	.6360	.6395	.6429	.6464	.6496
161	.6290	.6320	.6355	.6389	.6424	.6458	.6493
162	.6284	.6314	.6349	.6384	.6418	.6453	.6488
163	.6278	.6308	.6343	.6378	.6413	.6448	.6483
164	.6272	.6302	.6337	.6372	.6407	.6442	.6477
165	.6266	.6296	.6331	.6367	.6402	.6437	.6472
166	.6260	.6290	.6325	.6361	.6396	.6431	.6466
167	.6254	.6284	.6319	.6355	.6390	.6425	.6461
168	.6247	.6278	.6313	.6349	.6384	.6419	.6455
169	.6241	.6271	.6307	.6342	.6378	.6414	.6449
170	.6235	.6265	.6300	.6336	.6372	.6408	.6443
171	.6228	.6258	.6294	.6330	.6366	.6401	.6437
172	.6221	.6251	.6287	.6323	.6359	.6395	.6431
173	.6214	.6244	.6280	.6317	.6353	.6389	.6425
174	.6208	.6237	.6274	.6310	.6346	.6382	.6419
175	.6201	.6230	.6267	.6303	.6340	.6376	.6412
176	.6193	.6223	.6260	.6296	.6333	.6369	.6406
177	.6186	.6216	.6253	.6289	.6326	.6363	.6399
178	.6179	.6209	.6246	.6282	.6319	.6356	.6393
179	.6172	.6201	.6238	.6275	.6312	.6349	.6386
180	.6164	.6194	.6231	.6268	.6305	.6342	.6379
181	.6157	.6186	.6224	.6261	.6298	.6335	.6372
182	.6149	.6179	.6216	.6253	.6291	.6328	.6365
183	.6142	.6171	.6208	.6246	.6283	.6321	.6358
184	.6134	.6163	.6201	.6238	.6276	.6313	.6351
185	.6126	.6155	.6193	.6231	.6268	.6306	.6344
186	.6118	.6147	.6185	.6223	.6261	.6299	.6336
187	.6110	.6139	.6177	.6215	.6253	.6291	.6329
188	.6102	.6131	.6169	.6207	.6245	.6283	.6321
189	.6094	.6123	.6161	.6199	.6237	.6276	.6314
190	.6086	.6114	.6153	.6191	.6229	.6268	.6306
191	.6077	.6106	.6144	.6183	.6221	.6260	.6298
192	.6069	.6097	.6136	.6175	.6213	.6252	.6290
193	.6060	.6089	.6127	.6166	.6205	.6244	.6283
194	.6052	.6080	.6119	.6158	.6197	.6236	.6274
195	.6043	.6071	.6110	.6149	.6188	.6227	.6266
196	.6034	.6062	.6101	.6140	.6180	.6219	.6258
197	.6025	.6053	.6092	.6132	.6171	.6210	.6250
198	.6016	.6044	.6083	.6123	.6162	.6202	.6241
199	.6007	.6035	.6074	.6114	.6154	.6193	.6233
200	.5998	.6026	.6065	.6105	.6145	.6185	.6224
201	.5989	.6016	.6056	.6096	.6136	.6176	.6216
202	.5980	.6007	.6047	.6087	.6127	.6167	.6207
203	.5971	.5997	.6037	.6078	.6118	.6158	.6198
204	.5961	.5988	.6028	.6068	.6109	.6149	.6189
205	.5952	.5978	.6018	.6059	.6099	.6140	.6180
206	.5942	.5968	.6009	.6049	.6090	.6130	.6171
207	.5932	.5958	.5999	.6040	.6080	.6121	.6162
208	.5923	.5948	.5989	.6030	.6071	.6112	.6153
209	.5913	.5938	.5979	.6020	.6061	.6102	.6143

λ Conductividad del D₂O :J/m s°K
Presión en bars

°C	Sat.	50	100	150	200	250	300
210	.5903	.5928	.5969	.6010	.6052	.6093	.6134
211	.5893	.5918	.5959	.6000	.6042	.6083	.6124
212	.5883	.5908	.5949	.5990	.6032	.6073	.6115
213	.5873	.5897	.5939	.5980	.6022	.6063	.6105
214	.5863	.5887	.5928	.5970	.6012	.6053	.6095
215	.5852	.5876	.5918	.5960	.6002	.6043	.6085
216	.5842	.5866	.5908	.5949	.5991	.6033	.6075
217	.5832	.5855	.5897	.5939	.5981	.6023	.6065
218	.5821	.5844	.5886	.5928	.5971	.6013	.6055
219	.5810	.5833	.5875	.5918	.5960	.6002	.6045
220	.5800	.5822	.5865	.5907	.5950	.5992	.6034
221	.5789	.5811	.5854	.5896	.5939	.5981	.6024
222	.5778	.5800	.5843	.5885	.5928	.5971	.6014
223	.5767	.5789	.5831	.5874	.5917	.5960	.6003
224	.5756	.5777	.5820	.5863	.5906	.5949	.5992
225	.5745	.5766	.5809	.5852	.5895	.5938	.5982
226	.5734	.5754	.5798	.5841	.5884	.5927	.5971
227	.5723	.5743	.5786	.5829	.5873	.5916	.5960
228	.5711	.5731	.5775	.5818	.5862	.5905	.5949
229	.5700	.5719	.5763	.5807	.5850	.5894	.5938
230	.5689	.5707	.5751	.5795	.5839	.5883	.5926
231	.5677	.5695	.5739	.5783	.5827	.5871	.5915
232	.5665	.5683	.5727	.5771	.5816	.5860	.5904
233	.5654	.5671	.5715	.5760	.5804	.5848	.5892
234	.5642	.5659	.5703	.5748	.5792	.5836	.5881
235	.5630	.5647	.5691	.5736	.5780	.5825	.5869
236	.5618	.5634	.5679	.5723	.5768	.5813	.5857
237	.5606	.5622	.5666	.5711	.5756	.5801	.5845
238	.5594	.5609	.5654	.5699	.5744	.5789	.5834
239	.5582	.5596	.5641	.5686	.5731	.5777	.5822
240	.5569	.5584	.5629	.5674	.5719	.5764	.5809
241	.5557	.5571	.5616	.5661	.5707	.5752	.5797
242	.5544	.5558	.5603	.5649	.5694	.5740	.5785
243	.5532	.5545	.5590	.5636	.5681	.5727	.5773
244	.5519	.5532	.5577	.5623	.5669	.5714	.5760
245	.5507	.5518	.5564	.5610	.5656	.5702	.5748
246	.5494	.5505	.5551	.5597	.5643	.5689	.5735
247	.5481	.5492	.5538	.5584	.5630	.5676	.5722
248	.5468	.5478	.5524	.5571	.5617	.5663	.5709
249	.5455	.5465	.5511	.5557	.5604	.5650	.5696
250	.5442	.5451	.5497	.5544	.5590	.5637	.5683
251	.5429	.5437	.5484	.5530	.5577	.5624	.5670
252	.5416	.5423	.5470	.5517	.5563	.5610	.5657
253	.5402	.5409	.5456	.5503	.5550	.5597	.5644
254	.5389	.5395	.5442	.5489	.5536	.5583	.5630
255	.5376	.5381	.5428	.5475	.5522	.5570	.5617
256	.5362	.5367	.5414	.5461	.5509	.5556	.5603
257	.5348	.5352	.5400	.5447	.5495	.5542	.5589
258	.5335	.5338	.5385	.5433	.5481	.5528	.5576
259	.5321	.5323	.5371	.5419	.5466	.5514	.5562

λ Conductividad del D₂O :J/m s°K
Presión en bars

°C	Sat.	50	100	150	200	250	300
260	.5307	.5309	.5357	.5404	.5452	.5500	.5548
261	.5293	.5294	.5342	.5390	.5438	.5486	.5534
262	.5279	.5279	.5327	.5375	.5423	.5471	.5519
263	.5265		.5312	.5361	.5409	.5457	.5505
264	.5250		.5297	.5346	.5394	.5442	.5491
265	.5236		.5283	.5331	.5379	.5428	.5476
266	.5221		.5267	.5316	.5365	.5413	.5462
267	.5207		.5252	.5301	.5350	.5398	.5447
268	.5192		.5237	.5286	.5334	.5383	.5432
269	.5178		.5221	.5270	.5319	.5368	.5417
270	.5163		.5206	.5255	.5304	.5353	.5402
271	.5148		.5190	.5240	.5289	.5338	.5387
272	.5133		.5175	.5224	.5273	.5323	.5372
273	.5118		.5159	.5208	.5258	.5307	.5357
274	.5103		.5143	.5192	.5242	.5292	.5341
275	.5088		.5127	.5177	.5226	.5276	.5326
276	.5072		.5111	.5160	.5210	.5260	.5310
277	.5057		.5094	.5144	.5194	.5244	.5294
278	.5042		.5078	.5128	.5178	.5228	.5278
279	.5026		.5062	.5112	.5162	.5212	.5262
280	.5011		.5045	.5095	.5146	.5196	.5246
281	.4995		.5028	.5079	.5129	.5180	.5230
282	.4979		.5012	.5062	.5113	.5163	.5214
283	.4963		.4995	.5045	.5096	.5147	.5197
284	.4947		.4978	.5029	.5079	.5130	.5181
285	.4931		.4961	.5012	.5062	.5113	.5164
286	.4915		.4943	.4994	.5045	.5096	.5147
287	.4898		.4926	.4977	.5028	.5079	.5130
288	.4882		.4909	.4960	.5011	.5062	.5113
289	.4866		.4891	.4942	.4994	.5045	.5096
290	.4849		.4874	.4925	.4976	.5028	.5079
291	.4832		.4856	.4907	.4959	.5010	.5062
292	.4815		.4838	.4889	.4941	.4993	.5044
293	.4799		.4820	.4872	.4923	.4975	.5027
294	.4782		.4802	.4854	.4905	.4957	.5009
295	.4765		.4783	.4835	.4887	.4939	.4991
296	.4747		.4765	.4817	.4869	.4921	.4973
297	.4730		.4747	.4799	.4851	.4903	.4955
298	.4713		.4728	.4780	.4832	.4885	.4937
299	.4695		.4709	.4762	.4814	.4866	.4919
300	.4678		.4690	.4743	.4795	.4848	.4900
301	.4660		.4672	.4724	.4776	.4829	.4881
302	.4642		.4652	.4705	.4758	.4810	.4863
303	.4624		.4633	.4686	.4739	.4791	.4844
304	.4607		.4614	.4667	.4719	.4772	.4825
305	.4589		.4595	.4647	.4700	.4753	.4806
306	.4570		.4575	.4628	.4681	.4734	.4787
307	.4552		.4555	.4608	.4661	.4714	.4767
308	.4533		.4535	.4588	.4642	.4695	.4748
309	.4515		.4515	.4569	.4622	.4675	.4728

λ Conductividad del D₂O :J/m s°K
Presión en bars

°C	Sat.	50	100	150	200	250	300
310	.4497			.4549	.4602	.4655	.4708
311	.4477			.4528	.4582	.4635	.4688
312	.4459			.4508	.4562	.4615	.4668
313	.4440			.4488	.4541	.4595	.4648
314	.4421			.4467	.4521	.4574	.4628
315	.4402			.4447	.4500	.4554	.4607
316	.4382			.4426	.4479	.4533	.4587
317	.4363			.4405	.4459	.4512	.4566
318	.4343			.4384	.4438	.4491	.4545
319	.4324			.4363	.4416	.4470	.4524
320	.4304			.4341	.4395	.4449	.4503
321	.4284			.4320	.4374	.4428	.4482
322	.4264			.4298	.4352	.4406	.4460
323	.4244			.4276	.4330	.4384	.4438
324	.4224			.4254	.4308	.4362	.4417
325	.4204			.4232	.4286	.4340	.4395

12-p.39 a 45

CONSTANTE DIELECTRICA DEL D₂O.

t	ϵ	$-\frac{d\epsilon}{dt}$	$-\frac{1}{\epsilon} \frac{d\epsilon}{dt}$
°C			
4	85.877	0.3974	4.627x10 ⁻³
5	85.480	.3956	4.628
10	83.526	.3862	4.624
15	81.618	.3771	4.620
20	79.755	.3681	4.615
25	77.936	.3594	4.611
30	76.161	.3509	4.607
35	74.427	.3425	4.602
40	72.735	.3344	4.597
45	71.083	.3265	4.593
50	69.470	.3187	4.587
55	67.896	.3112	4.583
60	66.358	.3038	4.578
65	64.857	.2967	4.575
70	63.391	.2898	4.571
75	61.959	.2830	4.567
80	60.561	.2765	4.565
85	59.194	.2701	4.563
90	57.859	.2640	4.563
95	56.554	.2581	4.564
100	55.278	.2523	4.564

14-p.E-64

CONSTANTE DIELECTRICA DEL H_2O

$t^{\circ}C$	ϵ	$t^{\circ}C$	ϵ
0	88.00	40	73,28
5	86.04	45	71.59
10	84.11	50	69.94
15	82.22	60	66.74
20	80.36	70	63.68
25	78.54	80	60.76
30	76.75	90	57.98
35	75.00	100	55.33

14-p.E-64

PARAMETROS DE LA FORMULA DE RELAJACION DIELECTRICA

H_2O sólida			
$t^{\circ}C$	ϵ_0	ϵ_{∞}	τ ($\times 10^5$ seg)
- 0,1	91,5	3,10	2,2
- 10,8	95,0	3,08	6,0
- 20,9	97,4	3,10	16,4
- 32,0	100	3,00	57
- 44,7	104	3,10	252
- 56,8	114	3,1	1200
- 65,8	133	3,1	4500

13-p.10

PARAMETROS DE LA FORMULA DE RELAJACION DIELECTRICA

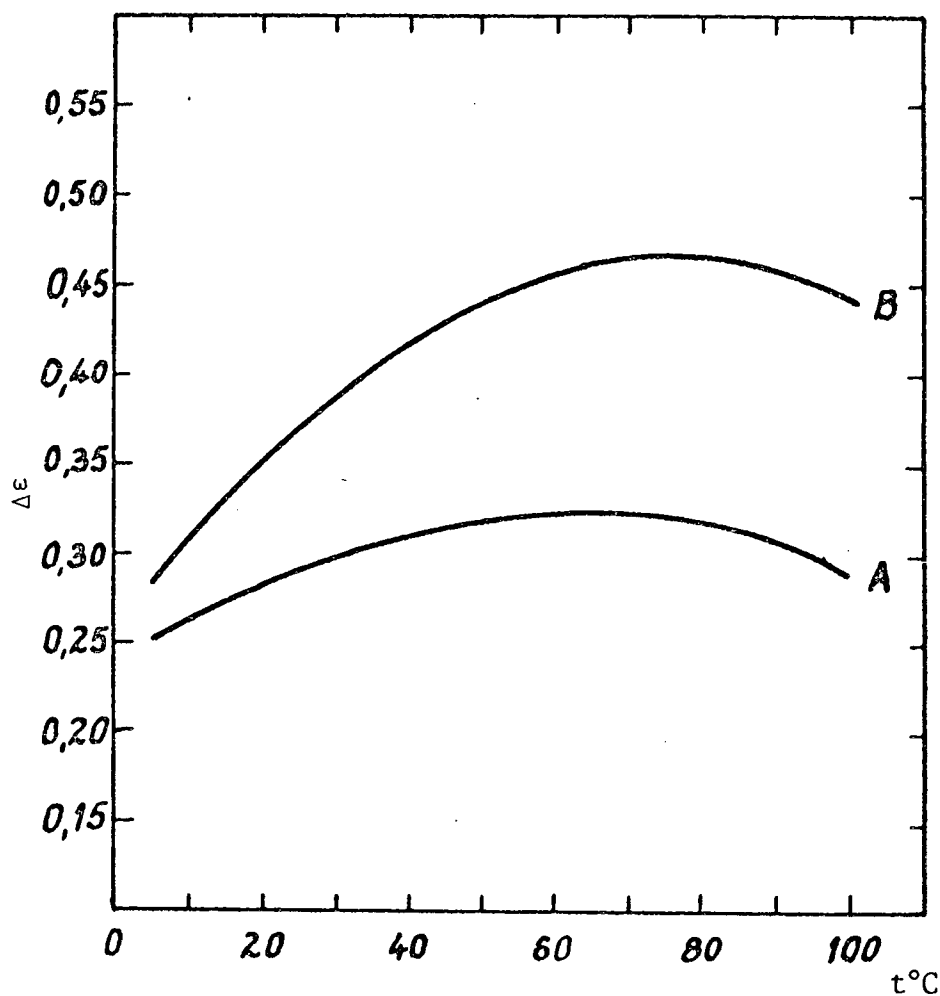
D_2O sólida			
$t^{\circ}C$	ϵ_0	ϵ_{∞}	τ ($\times 10^5$ seg)
- 1,2	90	3,06	3,4
- 2,7	89,0	3,06	5,0
- 10,4	92,0	3,03	9,15
- 21,7	95,5	3,06	33
- 27,3	97,9	3,03	48
- 33,0	100	3,03	91

13-p.10

CONSTANTE DIELECTRICA DEL D₂O DE 99,38 %

$$\epsilon = 87,48_2 - (0,40509) t + (9,638 \cdot 10^{-4}) t^2 - (1,333 \cdot 10^{-6}) t^3$$

13-p.10



Diferencias entre las constantes dieléctricas del D₂O y H₂O = Δε.

A: curva de WYMAN y INGALLS, (1936)

B: curva de MALMBERG, C. G. (1958).

13-p.10

DENSIDAD ρ^t (en g/cm^3) DEL D_2O 100% CON LA COMPOSICION ISOTOPICA
NATURAL DE OXIGENO EN FUNCION DE LA TEMPERATURA

$$S_T^T = \rho^T / \rho_{\text{H}_2\text{O}}^T$$

T (°C)	ρ^T	S_T^T
20	1,10530	1,10726
25	1,10437	1,10762
30	1,10315	1,10795
35	1,10167	1,10825
40	1,09989	1,10849
45	1,09786	1,10868
50	1,09562	1,10885

13-p.33

T (°C)	ρ^T	S_T^T
55	1,09316	1,10899
60	1,09051	1,10910
65	1,08766	1,10919
70	1,08466	1,10927
75	1,08148	1,10934
80	1,07815	1,10940
85	1,07467	1,10945
90	1,07104	1,10950
95	1,06729	1,10954
100	1,06339	1,10957

13-p.34

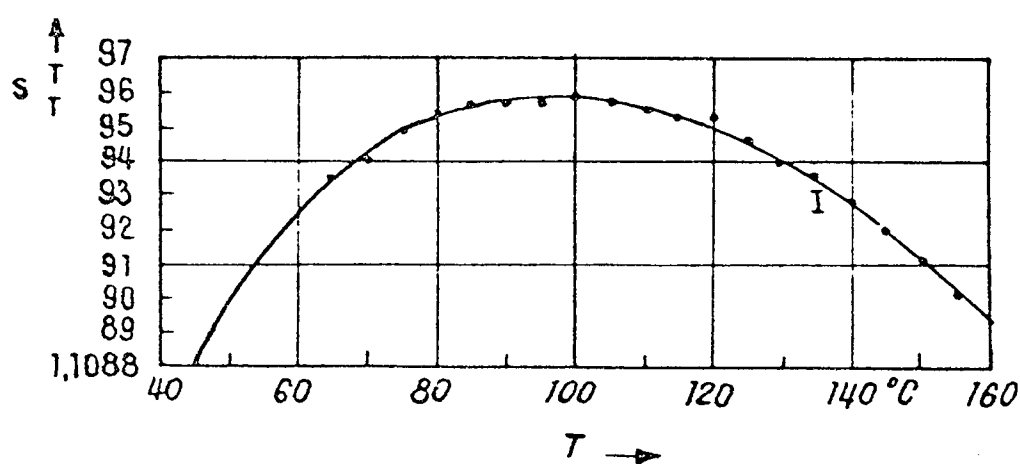
DENSIDAD DEL D₂O y H₂O

T (°C)	Densidad D ₂ O 99,20 ‰ (valores medios)	Densidad D ₂ O 99,20‰ (en g./cm ³)	Densidad H ₂ O (a) (en g./cm ³)	Densidad D ₂ O 10‰ calculada (en g./cm ³)	Relación $\frac{\rho_{D_2O}}{\rho_{H_2O}}$
30	1,1023		0,99564	1,1032	1,1080
34,3	1,1009	1,1009			
40	1,0990		,99221	1,0999	1,1085
50	1,0948		,98804	1,0957	1,1090
51,1	1,0940	1,0939			
60	1,0897		,98321	1,0906	1,1092
70	1,0838		,97778	1,0847	1,1093
74,9	1,0806	1,0806			
80	1,0773		,97180	1,0782	1,1095
90	1,0700		,96531	1,0708	1,1093
100	1,0622		,95835	1,0630	1,1092
101,4	1,0611	1,0612			
109,2	1,0549	1,0549			
110	1,0539		,9510	1,0547	1,1090
120	1,0451		,9434	1,0459	1,1086
130	1,0358		,9352	1,0366	1,1084
131,5	1,0344	1,0340			
140	1,0260		,9264	1,0268	1,1084
150	1,0159		,9173	1,0167	1,1084
151,0	1,0145	1,0143			
160	1,0050		,9076	1,0058	1,1082
170	0,9942		,8980	0,9950	1,1080
173,3	,9899	0,9903			
177,7	,9840	,9831			
180	,9818		,8874	,9826	1,1073
183,5	,977	,978			
190	,969		,8761	,970	1,107
200	,956		,8649	,957	1,106
207,2	,946	,947			
210	,942		,8528	,943	1,106
220	,927		,8403	,928	1,104
226,1	,919	,920			
230	,912		,8273	,913	1,104
240	,896		,8138	,897	1,102
246,1	,886	,885			
250	,880		,7991	,881	1,102

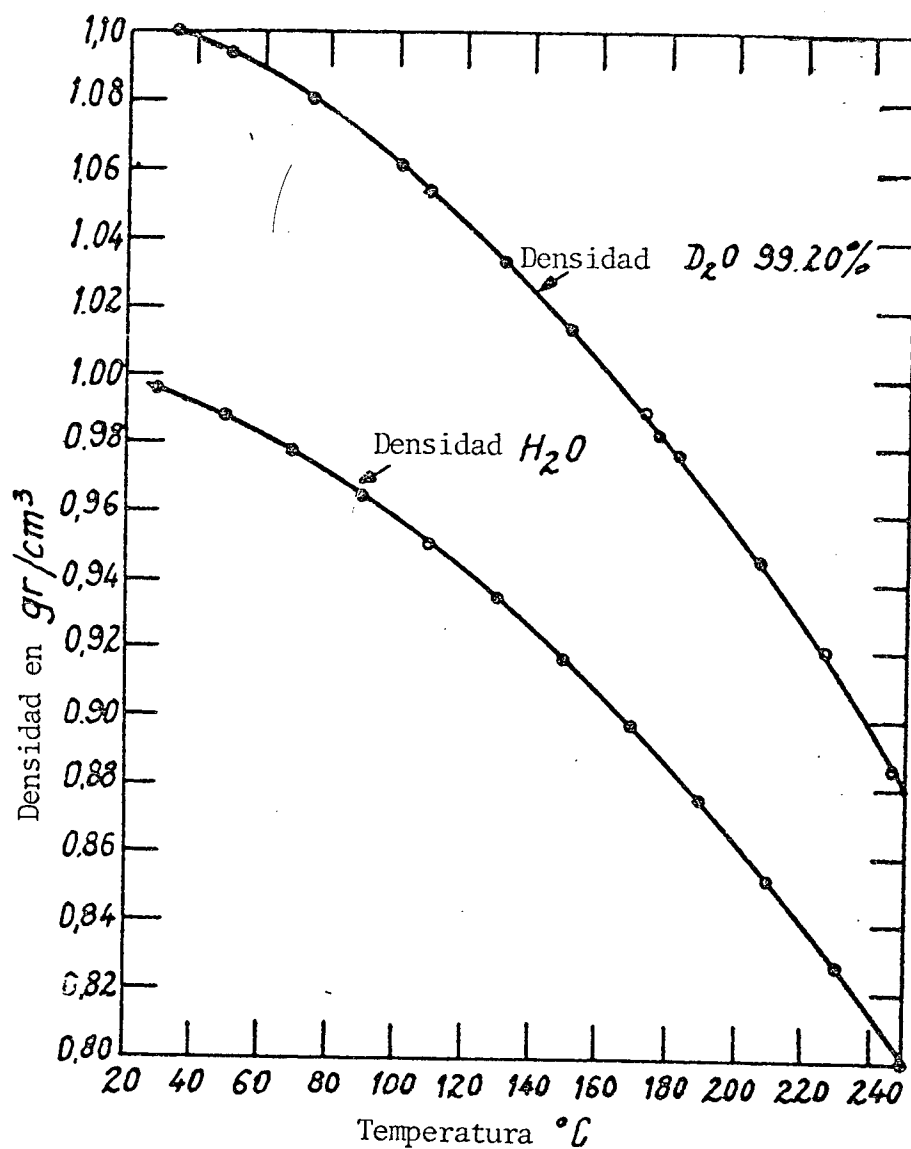
DENSIDAD DEL H₂O, D₂O Y VOLUMEN MOLAR

T °C	S _T ^r	ρ_{H_2O} (en g. cm ⁻³)	ρ_{D_2O} (en g. cm ⁻³)	Volumen molar (cm ³)
95,0	1,10958	0,961975	1,06739	18,7691
100,0	958	58425	6345	18,8386
105,0	958	54761	5938	18,9110
110,0	956	50990	5518	18,9863
115,0	954	47104	5085	19,0645
120,0	950	43112	4639	19,1457
125,0	946	39012	4180	19,2301
130,0	941	34807	3708	19,3176
135,0	935	30495	3224	19,4082
140,0	928	26081	2728	19,5019
145,0	920	21560	2220	19,5988
150,0	912	16936	1699	19,6992
155,0	903	12206	1167	19,8028
160,0	894	07370	0622	19,9101

13-p.36

Relación de densidades del D₂O y H₂O

13-p.37



Densidad del D₂O y H₂O

13-p.36

VALOR MEDIO DE LA DENSIDAD d_4^t DEL D₂O

D ₂ O conteniendo O del aire				D ₂ O conteniendo O electrolítico			
T (°C)	30°	40°	50°	T (°C)	30°	40°	50°
d_4^t	1,10323 ₈	1,09994 ₀	1,09570 ₈	d_4^t	1,10332 ₂	1,10003 ₃	1,09575 ₇

13-p.37

VOLUMEN MOLAR DEL H_2O Y D_2O (en cm^3)

T (°C)	H_2O	D_2O	T (°C)	H_2O	D_2O
20	18,05302	18,12532	65	18,37778	18,41928
25	18,07402	18,14058	70	18,43003	18,47022
30	18,09944	18,16064	75	18,48523	18,52453
35	18,12875	18,18504	80	18,54343	18,58175
40	18,16200	18,21447	85	18,60431	18,64192
45	18,19868	18,24815	90	18,66810	18,70510
50	18,23865	18,28546	95	18,73447	18,77082
55	18,28195	18,32661	100	18,80367	18,83967
60	18,32825	18,37114			

13-p.34

DENSIDAD Y VOLUMEN MOLAR DEL H_2O Y D_2O

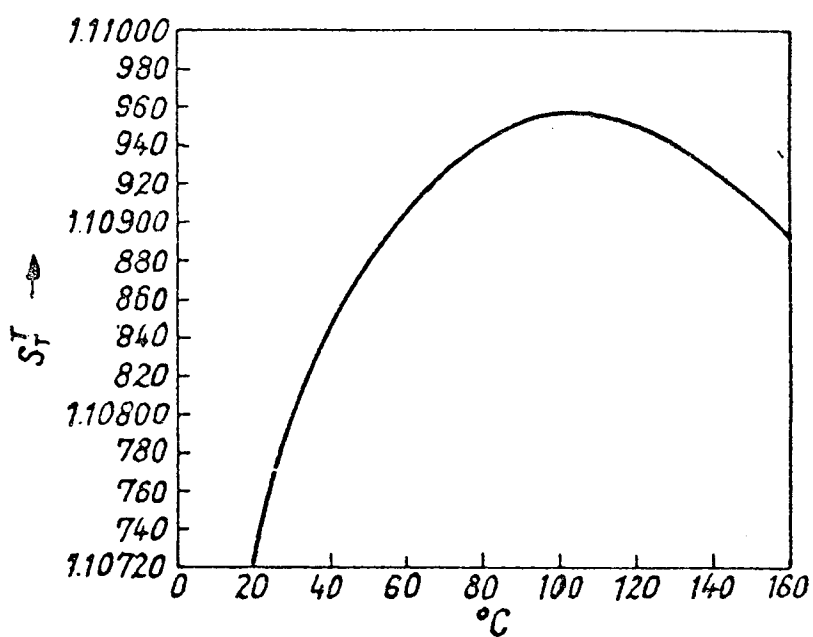
T (°C)	S_t^t	$\rho_{\text{H}_2\text{O}}$ ($\text{g}\cdot\text{cm}^{-3}$)	$\rho_{\text{D}_2\text{O}}$ ($\text{g}\cdot\text{cm}^{-3}$)	Volumen molar (cm^3)
60	1,10923	0,983262	1,09066	18,3686
65	933	80634	8785	4161
70	941	77857	8484	4672
75	948	74941	8168	5211
80	954	71889	7835	5783
85	957	68708	7485	6388
90	958	65396	7118	7026
95	959	61970	6739	7691
100	959	58425	6346	8384

13-p.37

DENSIDAD DEL D_2O CONTENIENDO
OXIGENO DEL AIRE

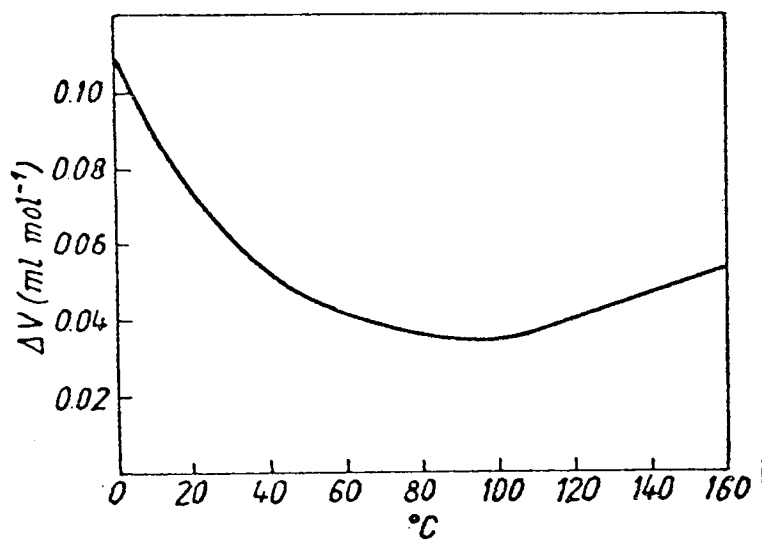
T (°C)	30°	40°	50°
d_4^t	1,10324	1,09995	1,09569

13-p.38



Relación de densidades del H_2O y D_2O ,
en función de la temperatura.

13-p.38

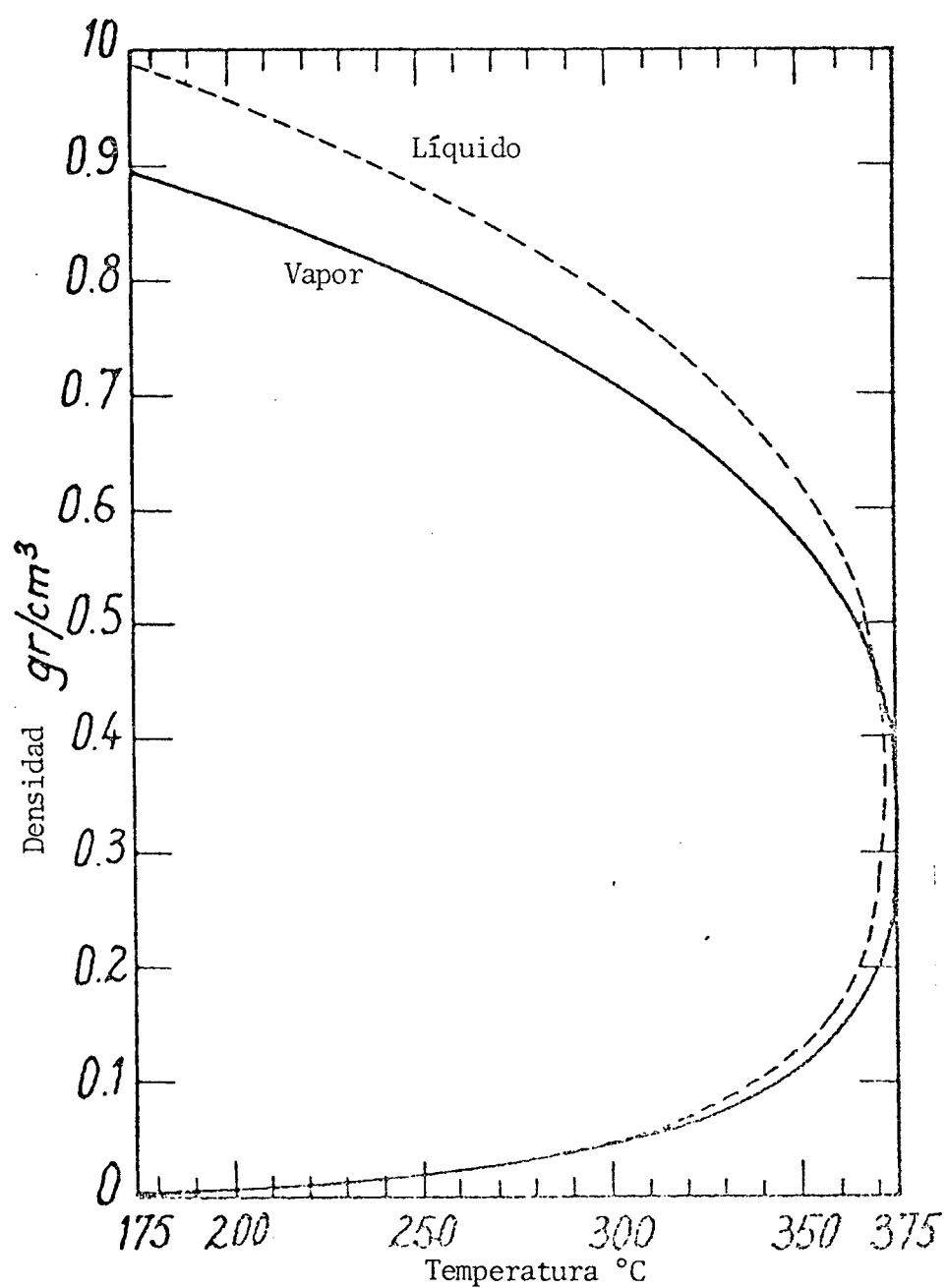


Diferencias de volúmenes molares del
 D_2O y H_2O en función de la temperatura.

13-p.38

DENSIDAD DEL D₂O LIQUIDO Y VAPOR (en g/cm³)

Densidad (g/cm ³)		
T (°C)	Vapor	Líquido
175	0,004	0,989
180	,005	,983
190	,006	,970
200	,007	,957
210	,009	,943
220	,010	,929
230	,013	,913
240	,016	,898
250	,020	,881
260	,024	,864
270	,029	,847
280	,034	,829
290	,040	,809
300	,048	,787
310	,058	,763
320	,070	,735
330	,087	,705
340	,105	,668
350	,129	,626
360	,163	,573
370	,248	,462
371.5	,363	,363 a
a- punto crítico.		



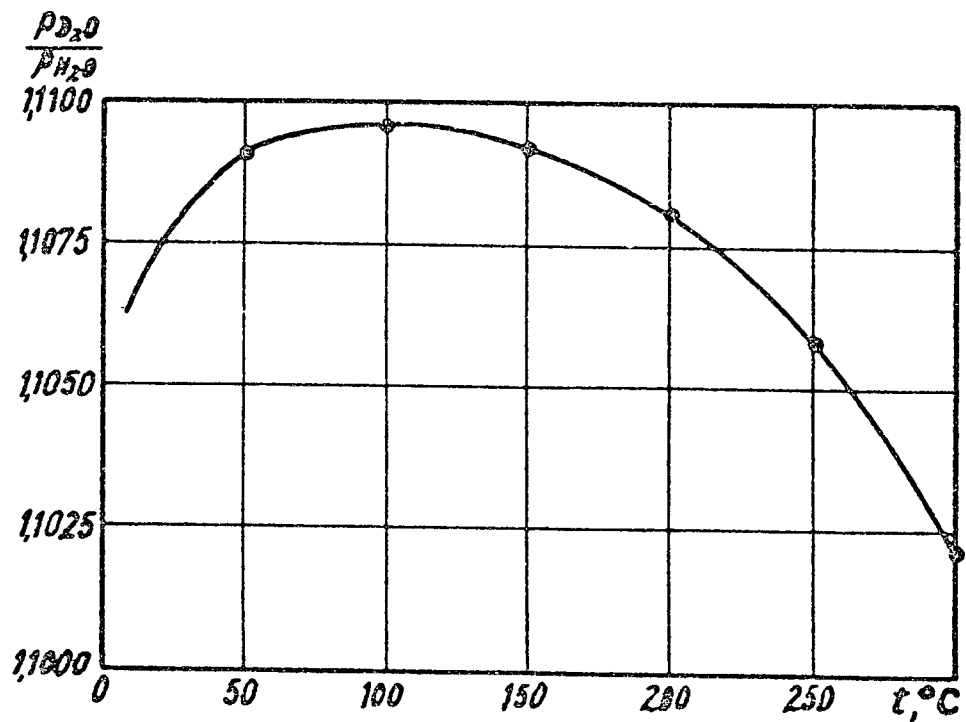
Densidad del D_2O líquida y del vapor saturado a temperaturas elevadas.

13-p.39

RELACION DE DENSIDADES $\rho_{D_2O} / \rho_{H_2O}$ A DIFERENTES TEMPERATURAS

T° C	$\rho_{D_2O} / \rho_{H_2O}$	T° C	$\rho_{D_2O} / \rho_{H_2O}$
50	1,10904	180	1,10862
60	1,10930	190	1,10834
70	1,10944	200	1,10802
80	1,10950	210	1,10772
90	1,10953	220	1,10740
100	1,10955	230	1,10704
110	1,10955	240	1,10660
120	1,10951	250	1,10610
130	1,10943	260	1,10552
140	1,10933	270	1,10484
150	1,10920	280	1,10405
160	1,10905	290	1,10315
170	1,10855	300	1,10210

13-p.42



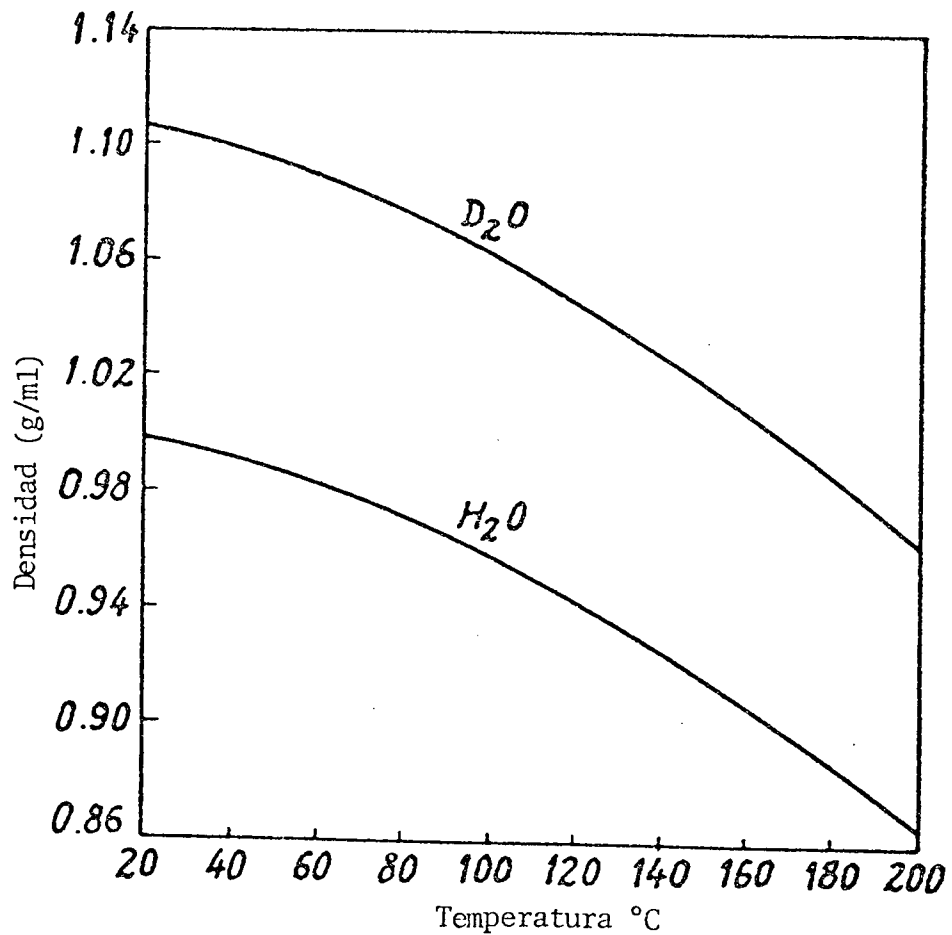
Relación de densidades del D_2O y H_2O .

13-p.42

DENSIDADES ORTOBARICAS DEL D_2O LIQUIDA 99,95% en g/cm^3

T (°C)	d_1 para H_2O	d_1 para D_2O
20	0,9982	1,106
40	0,9922	1,100
60	0,9832	1,089
80	0,9718	1,077
100	0,9584	1,063
120	0,9434	1,047
140	0,9264	1,029
160	0,9076	1,009
180	0,8874	0,986
200	0,8649	0,963

13-p.43



Densidad del D_2O y H_2O .

13-p.43

DENSIDAD DEL H_2O Y D_2O

H_2O		D_2O	
$\gamma, g/cm^3$	$t, ^\circ C$	$\gamma, g/cm^3$	$t, ^\circ C$
0.157	364.0	0.158	356.7
0.244	373.1	0.159	356.8
0.271	374.0	0.271	370.2
0.288	374.0	0.281	370.7
0.317	374.0	0.282	370.7
0.322	374.3	0.299	371.2
0.329	374.2	0.311	371.3
0.343	374.2	0.326	371.5
0.344	374.2	0.328	371.4
0.354	374.2	0.352	371.5
0.392	373.9	0.365	371.4
0.398	373.7	0.382	371.5
0.402	373.4	0.389	371.5
0.409	372.9	0.403	371.6
0.410	373.4	0.418	371.3
0.440	371.8	0.425	371.2
0.478	367.2	0.438	370.8
0.481	366.5	0.443	370.6
0.490	365.4	0.477	369.1
0.491	365.4	0.533	364.0

15-p.12

DENSIDAD DEL D_2O 100%

$t, ^\circ C$	$\rho, g/cm^3$	$t, ^\circ C$	$\rho, g/cm^3$	$t, ^\circ C$	$\rho, g/cm^3$	$t, ^\circ C$	$\rho, g/cm^3$
30	1.1032	90	1.0708	150	1.0167	210	0.943
40	1.0999	100	1.0630	160	1.0058	220	0.928
50	1.0957	110	1.0547	170	0.9950	230	0.913
60	1.0906	120	1.0459	180	0.9826	240	0.897
70	1.0847	130	1.0366	190	0.970	250	0.881
80	1.0782	140	1.0268	200	0.957	---	-----

15-p.15

DENSIDAD DEL AGUA PESADA 99,54%

$t, ^\circ\text{C}$	$\rho_t, \text{g/ml}$	d_t^t	$t, ^\circ\text{C}$	$\rho_t, \text{g/ml}$	d_t^t
4	1.10487	1.10487	28	1.10322	1.10736
5	1.10501	1.10502	29	1.10296	1.10742
6	1.10513	1.10516	31.1	1.10248	1.10758
7	1.10523	1.10531	32	1.10217	1.10765
8	1.10530	1.10544	33	1.10186	1.10770
9	1.10535	1.10556	34	1.10154	1.10774
10	1.10539	1.10569	35	1.10121	1.10779
11	1.10540	1.10581	36.1	1.10084	1.10785
12	1.10540	1.10593	37	1.10053	1.10789
13	1.10537	1.10603	37.9	1.10022	1.10794
14	1.10533	1.10614	39.2	1.09977	1.10786
15	1.10527	1.10624	40	1.09948	1.10807
16	1.10519	1.10633	40.8	1.09917	1.10810
17	1.10510	1.10643	41.3	1.09892	1.10807
18	1.10499	1.10651	42	1.09865	1.10810
19	1.10490	1.10663	42.7	1.09836	1.10806
20	1.10480	1.10676	45.3	1.09729	1.10825
21	1.10465	1.10684	46	1.09699	1.10827
22	1.10448	1.10692	46.7	1.09668	1.10828
25	1.10391	1.10715	49.3	1.09555	1.10843
26	1.10370	1.10723	50	1.09523	1.10845
27	1.10346	1.10729			

DENSIDAD DEL AGUA LIVIANA, g/ml ENTRE 0 Y 40°C

$t, ^\circ\text{C}$	ρ		$t, ^\circ\text{C}$	ρ	
0	0.999867 ₉	(1)	21	0.99802 ₁₀	(25)
1	0.9999267	(0)	22	0.99779 ₉₃	(27)
2	0.9999679	(0)	23	0.99756 ₇₄	(29)
3	0.9999922	(0)	24	0.99732 ₅₆	(30)
4	1.0000000	(0)	25	0.99707 ₃₉	(31)
5	0.999991 ₉	(1)	26	0.99681 ₂₈	(30)
6	0.999968 ₁	(1)	27	0.99654 ₂₁	(29)
7	0.999929 ₅	(2)	28	0.99626 ₂₃	(28)
8	0.999876 ₂	(3)	29	0.99597 ₃₅	(25)
9	0.999808 ₈	(5)	30	0.99567 ₅₈	(23)
10	0.999727 ₇	(6)	31	0.99536 ₉₂	(20)
11	0.999632 ₈	(2)	32	0.99505 ₁₂	(19)
12	0.999524 ₇	(0)	33	0.99473 ₀₈	(17)
13	0.999404 ₀	(1)	34	0.99439 ₉₁	(16)
14	0.999271 ₂	(1)	35	0.99405 ₉₄	(16)
15	0.999126 ₅	(2)	36	0.99371 ₁₉	(18)
16	0.998970 ₁	(6)	37	0.99335 ₆₃	(22)
17	0.998802 ₂	(9)	38	0.99299 ₃₆	(28)
18	0.99862 ₃₂	(14)	39	0.99262 ₃₂	(36)
19	0.99843 ₃₁	(18)	40	0.99224 ₅₃	(42)
20	0.99823 ₂₃	(22)			

15-p.23

DENSIDAD DEL AGUA LIVIANA, g/ml ENTRE 40 Y 100°C

$t, ^\circ\text{C}$	ρ	$t, ^\circ\text{C}$	ρ	$t, ^\circ\text{C}$	ρ
40	0.9922 ₄	61	0.9827 ₂	82	0.9705 ₇
41	0.9918 ₆	62	0.9822 ₀	83	0.9699 ₁
42	0.9914 ₇	63	0.9816 ₇	84	0.9693 ₀
43	0.9910 ₇	64	0.9811 ₃	85	0.9686 ₅
44	0.9906 ₆	65	0.9805 ₉	86	0.9680 ₀
45	0.9902 ₁	66	0.9800 ₅	87	0.9673 ₁
46	0.9898 ₂	67	0.9795 ₀	88	0.9666 ₈
47	0.9894 ₀	68	0.9789 ₄	89	0.9660 ₁
48	0.9889 ₆	69	0.9783 ₈	90	0.9653 ₄
49	0.9885 ₂	70	0.9778 ₁	91	0.9646 ₇
50	0.9880 ₇	71	0.9772 ₃	92	0.9639 ₉
51	0.9876 ₂	72	0.9766 ₇	93	0.9633 ₀
52	0.9871 ₅	73	0.9760 ₇	94	0.9626 ₁
53	0.9866 ₉	74	0.9754 ₈	95	0.9619 ₂
54	0.9862 ₁	75	0.9748 ₉	96	0.9612 ₂
55	0.9857 ₃	76	0.9742 ₉	97	0.9605 ₁
56	0.9852 ₅	77	0.9736 ₈	98	0.9598 ₁
57	0.9847 ₅	78	0.9730 ₇	99	0.9590 ₉
58	0.9842 ₅	79	0.9724 ₅	100	0.9583 ₈
59	0.9837 ₅	80	0.9718 ₃		
60	0.9832 ₄	81	0.9712 ₁		

15-p.23

DENSIDAD DEL AGUA PESADA

$t, ^\circ\text{C}$	$\rho_{\text{H}_2\text{O}}, \text{g/ml}$	$\rho_{\text{D}_2\text{O}}, \text{g/ml}$	d_t^t
3.8	1.00000	1.10533	1.10533
5	0.99999	1.10549	1.10560
10	0.99973	1.10588	1.10618
11.2	0.99961	1.10589	1.10632
15	0.99913	1.10577	1.10673
20	0.99823	1.10527	1.10723
25	0.99707	1.10440	1.10765
30	0.99568	1.10321	1.10797
35	0.99406	1.10172	1.10830
38	0.99299	1.10068	1.10845
39	0.99262	1.10032	1.10850
40	0.99225	1.09995	1.10854
41	0.99186	1.09956	1.10858
42	0.99147	1.09917	1.10863
43	0.99107	1.09876	1.10866
45	0.99024	1.09792	1.10874
50	0.98807	1.09572	1.10895

15-p.34

DENSIDAD DEL AGUA PESADA

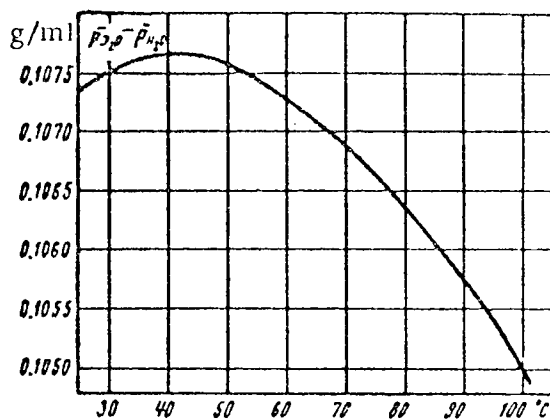
$t, ^\circ\text{C}$	d_t^t	
	Dato original	Valores corregidos
3.8	1.10538	1.10547
5	1.10556	1.10565
10	1.10625	1.10634
11.2	1.10639	1.10648
15	1.10678	1.10687
20	1.10726	1.10735
25	1.10764	1.10773
30	1.10798	1.10807
35	1.10827	1.10836
40	1.10851	1.10860
45	1.10871	1.10880
50	1.10888	1.10897
55	1.10902	1.10911
60	1.10913	1.10922
65	1.10924	1.10933
70	1.10933	1.10942
75	1.10940	1.10949
80	1.10946	1.10955
85	1.10950	1.10959
90	1.10954	1.10963
95	1.10957	1.10966
100	1.10960	1.10969
101.4	1.10960	1.10969

15-p.38

DENSIDAD DEL AGUA PESADA

Serie	Conc. de la muestra mol% de D ₂ O	t, °C	Densidad g/ml
I	99.87	25.00	1.10426
		50.35	1.09534
		55.36	1.09289
		60.27	1.09027
		65.35	1.08734
		70.29	1.08439
		75.66	1.08093
		80.67	1.07761
		85.82	1.07395
		90.89	1.07030
		95.98	1.06647
II	99.84	25.00	1.10423
		45.33	1.09758
		50.38	1.09527
		55.38	1.09281
		60.33	1.09020
		66.38	1.08675
		70.38	1.08429
		75.68	1.08088
		85.84	1.07392
		90.96	1.17022
		96.08	1.16633
III	99.81	25.00	1.10420
		30.10	1.10295
		35.10	1.10144
		40.17	1.09966
		45.31	1.09758

15-p.37



Diferencia entre las densidades del D₂O y agua liviana.

15-p.38

DENSIDAD DEL AGUA PESADA

t.°C	d_t^t		t.°C	d_t^t	
	original	corregida		original	corregida
20	1.10726	1.10735	65	1.10919	1.10928
25	1.10762	1.10771	70	1.10927	1.10936
30	1.10795	1.10804	75	1.10934	1.10943
35	1.10825	1.10834	80	1.10940	1.10949
40	1.10849	1.10858	85	1.10945	1.10954
45	1.10868	1.10877	90	1.10950	1.10959
50	1.10885	1.10894	95	1.10954	1.10963
55	1.10899	1.10908	100	1.10957	1.10966
60	1.10910	1.10919			

15-p.40

Comparación de los valores de K.Wirtz con los de Chang Tin-Li y Tung Liu-hu en la densidad del agua pesada.

t.°C	d_t^t	
	De acuerdo a Wirtz	De acuerdo a Chang y Tung
20	1.10735	1.10735
25	1.10774	1.10773
30	1.10802	1.10807
35	1.10830	1.10836
40	1.10856	1.10860
50	1.10889	1.10897

15-p.39

DEPENDENCIA DE LA DENSIDAD DEL AGUA PESADA
CON LA CONCENTRACION DEL HIDROGENO LIVIANO

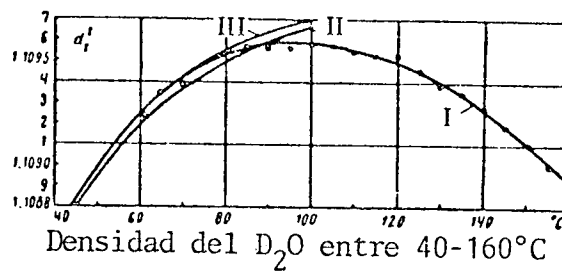
Densidad d_{25}^{25}	Concentración de hidrógeno liviano (Unidades arbitrarias)
1.107637	0.230
1.107632	0.234
1.107362	0.987
1.106881	2.250

15-p.41

DENSIDAD DEL AGUA PESADA EN FUNCION DEL
CONTENIDO DE DEUTERIO

Densidad d_{25}^{25}	Concentración del D, %
1.107637	99.90 $\pm$ 0.01
1.107586	99.85 $\pm$ 0.01
1.107362	99.65 $\pm$ 0.02
1.106881	99.16 $\pm$ 0.02

15-p.42



15-p.44

DENSIDAD DEL AGUA PESADA

t, °C	d_t^t	t, °C	d_t^t
95	1.10958	130	1.10941
100	1.10958	135	1.10935
105	1.10958	140	1.10928
110	1.10956	145	1.10920
115	1.10954	150	1.10912
120	1.10950	155	1.10903
125	1.10946	160	1.10894

15-p.43

DENSIDAD d_t^t DEL AGUA PESADA A 95 Y 100°C DE
ACUERDO A VARIOS AUTORES

Autores	95°C	100°C
Grossmann-Doerth.....	1.10958	1.10958
Chang y Tung.....	1.10966	1.10969
Diferencia entre los valores. Grossmann-Doerth.....	0.00008	0.00011
Schrader y Wirtz.....	1.10963	1.10966
Diferencia entre los valores. Grossmann-Doerth.....	0.00005	0.00008

15-p.43

DENSIDAD DEL AGUA PESADA PURA

$t, ^\circ\text{C}$	d_t^t
60	1.10923
65	1.10933
70	1.10941
75	1.10948
80	1.10954
85	1.10957
90	1.10958
95	1.10959
100	1.10959

15-p.44

DENSIDAD DEL D_2O a 25°C

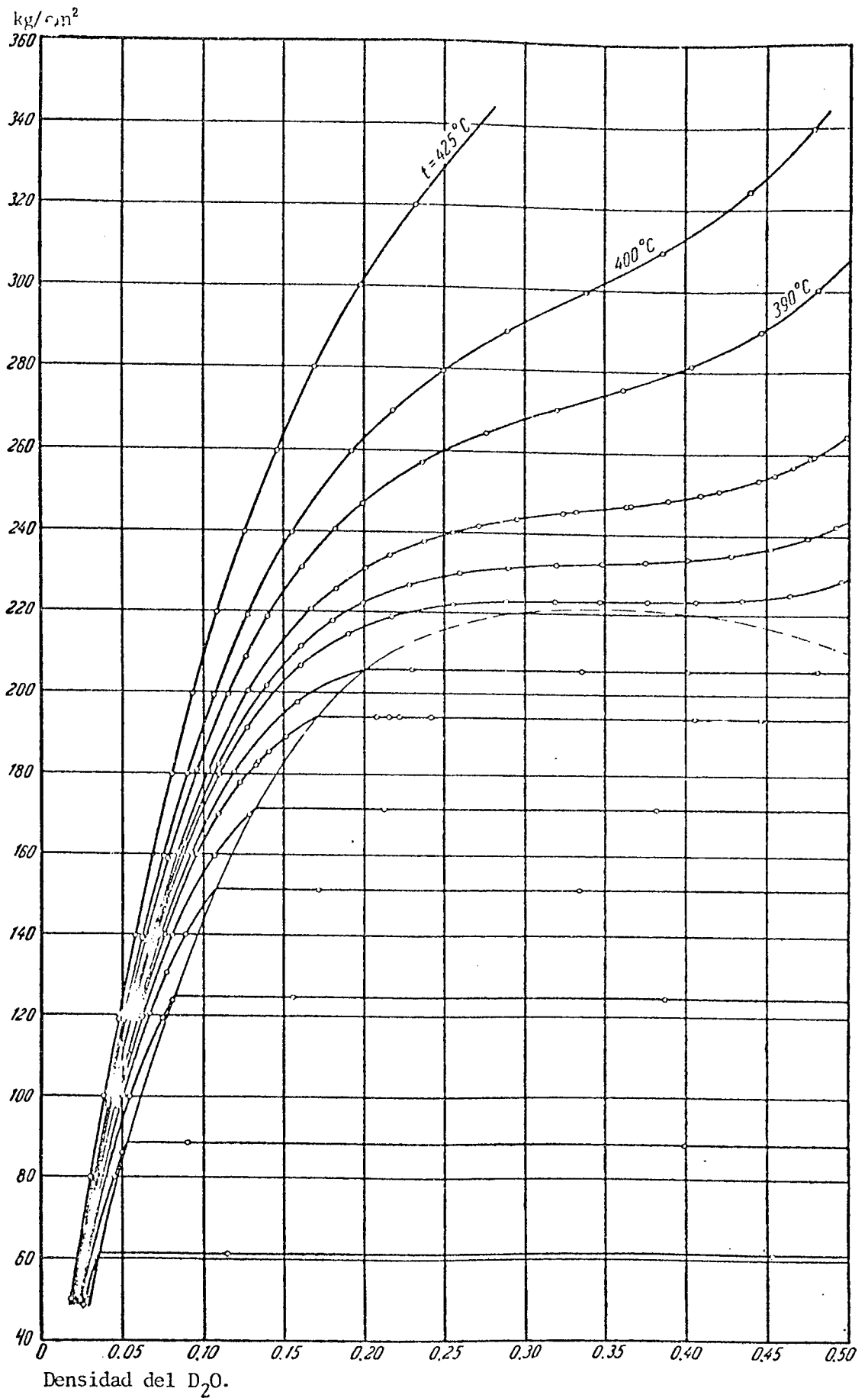
Autores	d_{25}^{25}
I. Kirshenbaum, J. Graff y H. Forstat.....	1.10775
R.J. Voskuil y B. Barash.....	1.10774 ₄
Chang Tin-Li y Tung Liu-hu.....	1.10773
A.L. Shatenshtein, L.M. Yakimenco, V.R. Kalinachenko, y E.A. Yakovleva.....	1.10770
K.V. Vladimirkii, M. Ya. Kats, y B.M. Stasevich.....	1.10772
	1.10774
P. Isberg y L. Lundberg.....	1.10774
Promedio	1.10773

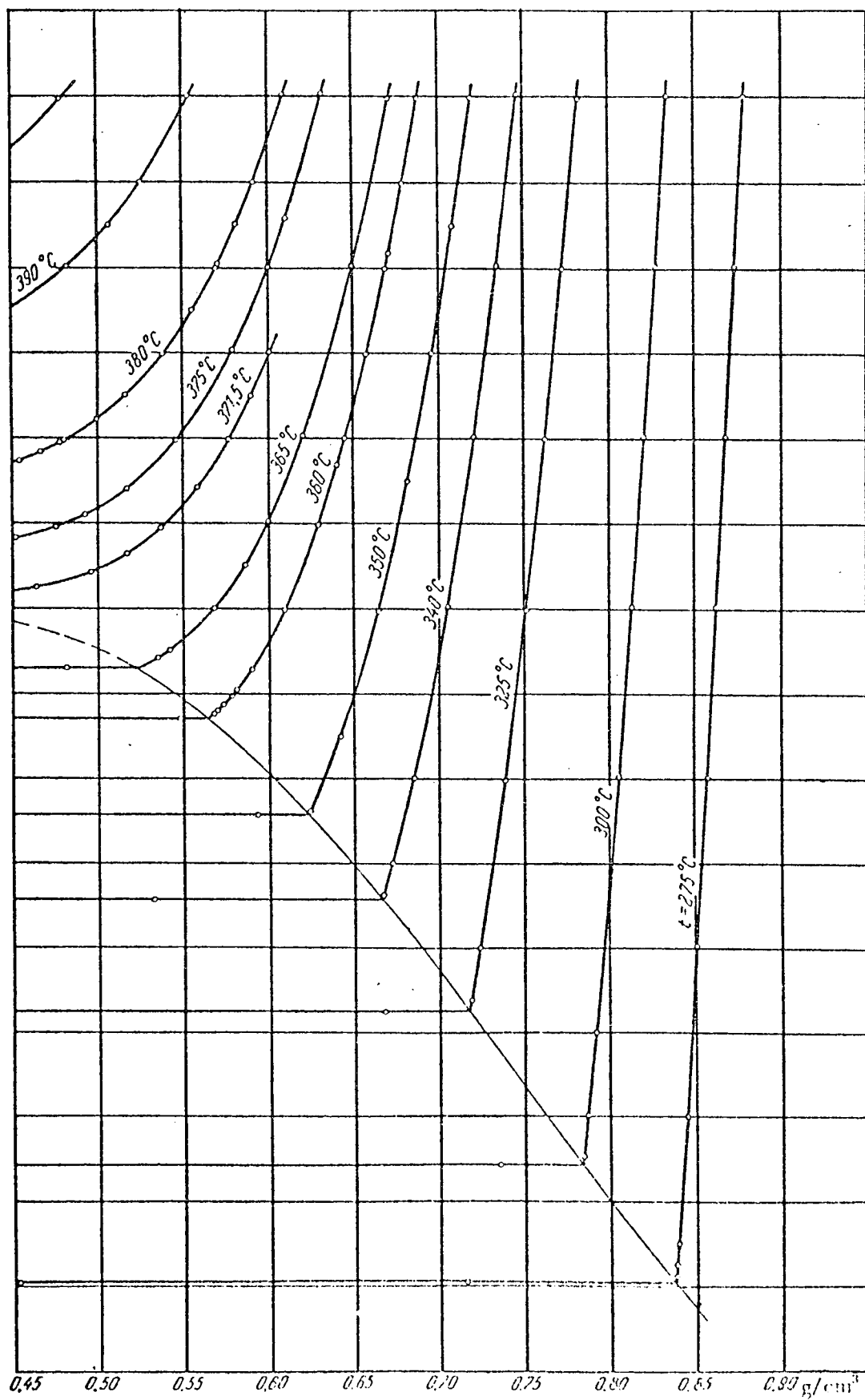
15-p.46

DENSIDAD DEL D₂O A PRESION ATMOSFERICA

$t, ^\circ\text{C}$	d_t^t	ρ		$t, ^\circ\text{C}$	d_t^t	ρ	
		g/ml	g/cm ³			g/ml	g/cm ³
3.8	1.10545 ₀	1.10545 ₀	1.10541 ₉	53	1.10906 ₀	1.0942 ₀	1.0942 ₀
4	1.10548 ₀	1.10548 ₀	1.10544 ₉	54	1.10908 ₅	1.0937 ₀	1.0937 ₀
5	1.10564 ₀	1.10563 ₁	1.10560 ₀	55	1.10911 ₀	1.0932 ₈	1.0932 ₅
6	1.10580 ₀	1.10576 ₅	1.10573 ₄	56	1.10913 ₅	1.0927 ₇	1.0927 ₄
7	1.10595 ₀	1.10587 ₂	1.10584 ₁	57	1.10916 ₀	1.0922 ₅	1.0922 ₂
8	1.10609 ₀	1.10595 ₃	1.10592 ₂	58	1.10918 ₅	1.0917 ₂	1.0916 ₀
9	1.10622 ₀	1.10600 ₈	1.10597 ₇	59	1.10921 ₀	1.0911 ₈	1.0911 ₅
10	1.10634 ₀	1.10603 ₉	1.10600 ₈	60	1.10923 ₀	1.0906 ₃	1.0906 ₀
11	1.10645 ₅	1.10604 ₉	1.10601 ₈	61	1.10925 ₀	1.0900 ₈	1.0900 ₅
12	1.10656 ₅	1.10603 ₉	1.10600 ₈	62	1.10927 ₀	1.0895 ₂	1.0894 ₀
13	1.10667 ₀	1.10601 ₁	1.10598 ₀	63	1.10929 ₀	1.0889 ₅	1.0889 ₂
14	1.10677 ₅	1.10596 ₇	1.10593 ₆	64	1.10931 ₀	1.0883 ₈	1.0883 ₅
15	1.10687 ₅	1.10590 ₈	1.10587 ₇	65	1.10933 ₀	1.0878 ₀	1.0877 ₇
16	1.10697 ₅	1.10583 ₅	1.10580 ₄	66	1.10935 ₀	1.0872 ₁	1.0871 ₈
17	1.10707 ₅	1.10574 ₈	1.10571 ₇	67	1.10936 ₅	1.0866 ₂	1.0865 ₀
18	1.10717 ₀	1.10564 ₈	1.10561 ₅	68	1.10938 ₀	1.0860 ₃	1.0860 ₀
19	1.10726 ₅	1.10552 ₉	1.10549 ₈	69	1.10939 ₅	1.0854 ₂	1.0853 ₉
20	1.10735 ₀	1.10539 ₃	1.10536 ₂	70	1.10941 ₀	1.0847 ₉	1.0847 ₆
21	1.10743 ₀	1.10523 ₈	1.10520 ₇	71	1.10942 ₅	1.0841 ₇	1.0841 ₄
22	1.10750 ₅	1.10506 ₈	1.10503 ₇	72	1.10944 ₀	1.0835 ₄	1.0835 ₁
23	1.10758 ₀	1.10488 ₈	1.10485 ₅	73	1.10945 ₅	1.0829 ₁	1.0828 ₈
24	1.10765 ₅	1.10469 ₃	1.10466 ₂	74	1.10947 ₀	1.0822 ₇	1.0822 ₄
25	1.10773 ₀	1.10448 ₇	1.10445 ₆	75	1.10948 ₀	1.0816 ₂	1.0815 ₀
26	1.10780 ₀	1.10426 ₉	1.10423 ₈	76	1.10949 ₀	1.0809 ₈	1.0809 ₅
27	1.10787 ₀	1.10404 ₀	1.10400 ₀	77	1.10950 ₀	1.0803 ₀	1.0802 ₇
28	1.10794 ₀	1.10379 ₉	1.10376 ₈	78	1.10951 ₀	1.0796 ₃	1.0796 ₀
29	1.10800 ₅	1.10354 ₄	1.10351 ₃	79	1.10952 ₀	1.0789 ₅	1.0789 ₂
30	1.10807 ₀	1.10327 ₇	1.10324 ₆	80	1.10953 ₀	1.0782 ₇	1.0782 ₄
31	1.10813 ₀	1.10299 ₉	1.10296 ₈	81	1.10954 ₀	1.0775 ₉	1.0775 ₆
32	1.10819 ₀	1.10271 ₀	1.10267 ₉	82	1.10955 ₀	1.0769 ₀	1.0768 ₇
33	1.10825 ₀	1.10241 ₀	1.10237 ₉	83	1.10956 ₀	1.0762 ₀	1.0761 ₇
34	1.10830 ₅	1.10209 ₈	1.10206 ₇	84	1.10956 ₅	1.0754 ₉	1.0754 ₆
35	1.10836 ₀	1.10177 ₅	1.10174 ₄	85	1.10957 ₀	1.0747 ₈	1.0747 ₅
36	1.10841 ₀	1.10144 ₁	1.10141 ₀	86	1.10957 ₀	1.0740 ₆	1.0740 ₃
37	1.10846 ₀	1.10109 ₆	1.10106 ₅	87	1.10957 ₅	1.0733 ₄	1.0733 ₁
38	1.10851 ₀	1.10074 ₁	1.10071 ₀	88	1.10957 ₅	1.0726 ₁	1.0725 ₈
39	1.10855 ₅	1.10037 ₇	1.10034 ₆	89	1.10858 ₀	1.0718 ₇	1.0718 ₄
40	1.10860 ₀	1.10000 ₃	1.09997 ₂	90	1.10958 ₀	1.0711 ₂	1.0710 ₉
41	1.10864 ₀	1.0996 ₂	1.0995 ₉	91	1.10958 ₅	1.0703 ₇	1.0703 ₄
42	1.10868 ₀	1.0992 ₂	1.0991 ₉	92	1.10958 ₅	1.0696 ₂	1.0695 ₉
43	1.10872 ₀	1.0988 ₂	1.0987 ₉	93	1.10958 ₅	1.0688 ₈	1.0688 ₅
44	1.10876 ₀	1.0984 ₁	1.0983 ₈	94	1.10959 ₀	1.0681 ₀	1.0680 ₇
45	1.10880 ₀	1.0979 ₉	1.0979 ₆	95	1.10959 ₀	1.0673 ₃	1.0673 ₀
46	1.10883 ₅	1.0975 ₈	1.0975 ₅	96	1.10959 ₀	1.0665 ₅	1.0665 ₂
47	1.10887 ₀	1.0971 ₂	1.0970 ₉	97	1.10959 ₀	1.0657 ₈	1.0657 ₅
48	1.10890 ₅	1.0966 ₇	1.0966 ₄	98	1.10959 ₀	1.0649 ₉	1.0649 ₆
49	1.10894 ₀	1.0962 ₁	1.0961 ₈	99	1.10959 ₀	1.0642 ₀	1.0641 ₇
50	1.10897 ₀	1.0957 ₄	1.0957 ₁	100	1.10959 ₀	1.0634 ₁	1.0633 ₈
51	1.10900 ₀	1.0952 ₈	1.0952 ₅	101	1.10959 ₀	1.0626 ₁	1.0625 ₈
52	1.10903 ₀	1.0947 ₈	1.0947 ₅	101.4	1.10959 ₀	1.0622 ₉	1.0622 ₆

NOTA: Los números subscriptos en los valores d_t^t se han aproximado a 0 ó 5.





DENSIDAD DEL D₂O PURA

50° C		100° C		150° C		200° C		250° C		300° C	
P. Kg/cm	γ. g/cm ³	P. Kg/cm ²	γ. g/cm ³	P. Kg/cm ²	γ. g/cm ³	P. Kg/cm ²	γ. g/cm ³	P. Kg/cm ²	γ. g/cm ³	P. Kg/cm ²	γ. g/cm ³
107.1	1.10085	70.2	1.06686	102.3	1.02285	102.50	1.02505	98.25	0.89145	111.95	0.79100
75.7	1.10938	13.5	1.06402	73.2	1.02113	70.55	1.02245	70.45	0.88789	93.95	0.78553
42.8	1.09784	64.3	1.06552	44.1	1.01937	44.70	1.02450	48.60	0.88598	—	—
11.5	1.09632	33.7	1.06525	13.9	1.01750	20.85	1.01846	—	—	—	—
—	—	10.5	1.06385	—	—	—	—	—	—	—	—
—	—	66.5	1.06661	—	—	—	—	—	—	—	—
—	—	10.3	1.06385	—	—	—	—	—	—	—	—
—	—	62.9	1.06650	—	—	—	—	—	—	—	—
—	—	11.4	1.06390	—	—	—	—	—	—	—	—
—	—	103.5	1.06855	—	—	—	—	—	—	—	—
—	—	9.7	1.06366	—	—	—	—	—	—	—	—
—	—	74.5	1.06705	—	—	—	—	—	—	—	—
—	—	12.9	1.06390	—	—	—	—	—	—	—	—

15-p.52

VALORES CALCULADOS DE DENSIDAD SOBRE LA LINEA DE SATURACION
(g/cm³). COMPARACION CON DATOS EXPERIMENTALES

t, °C	Grossmann y Doerth	Heiks, Barnett, Jones y Orban	Chang Chin-Li y Tung Liu-hu	Hebert, Mac Duf- fie y Secoy	Walley	Calculado
20	—	—	1.10530	—	1.1050	1.10534
40	—	1.0999	1.09992	—	1.0998	1.09999
60	—	1.0996	1.09954	—	1.0905	1.09051
80	—	1.0782	1.07821	—	1.0783	1.07828
100	1.06345	1.0630	1.06342	—	1.0635	1.06349
	1.04639	1.0159	—	—	1.0465	1.04646
140	1.02728	1.0268	—	—	1.0271	1.02712
160	1.00622	1.0058	—	—	1.0062	1.00583
180	—	0.9826	—	0.983	0.9828	0.9828
200	—	0.957	—	0.957	0.957	0.958
220	—	0.928	—	0.929	0.929	0.930
240	—	0.897	—	0.898	0.898	0.900
260	—	—	—	0.864	0.864	0.863
280	—	—	—	0.829	0.826	0.824
300	—	—	—	0.787	0.782	0.784
320	—	—	—	0.735	0.731	0.733
340	—	—	—	0.668	0.668	0.668
360	—	—	—	0.573	0.572	0.571
Desv.	0.017	0.07	0.005	0.21	0.09	

15-p.159

DENSIDAD A 25° C DEL D₂O (g/cm³) CON COMPOSICION
ISOTOPICA DEL OXIGENO DEL AIRE.

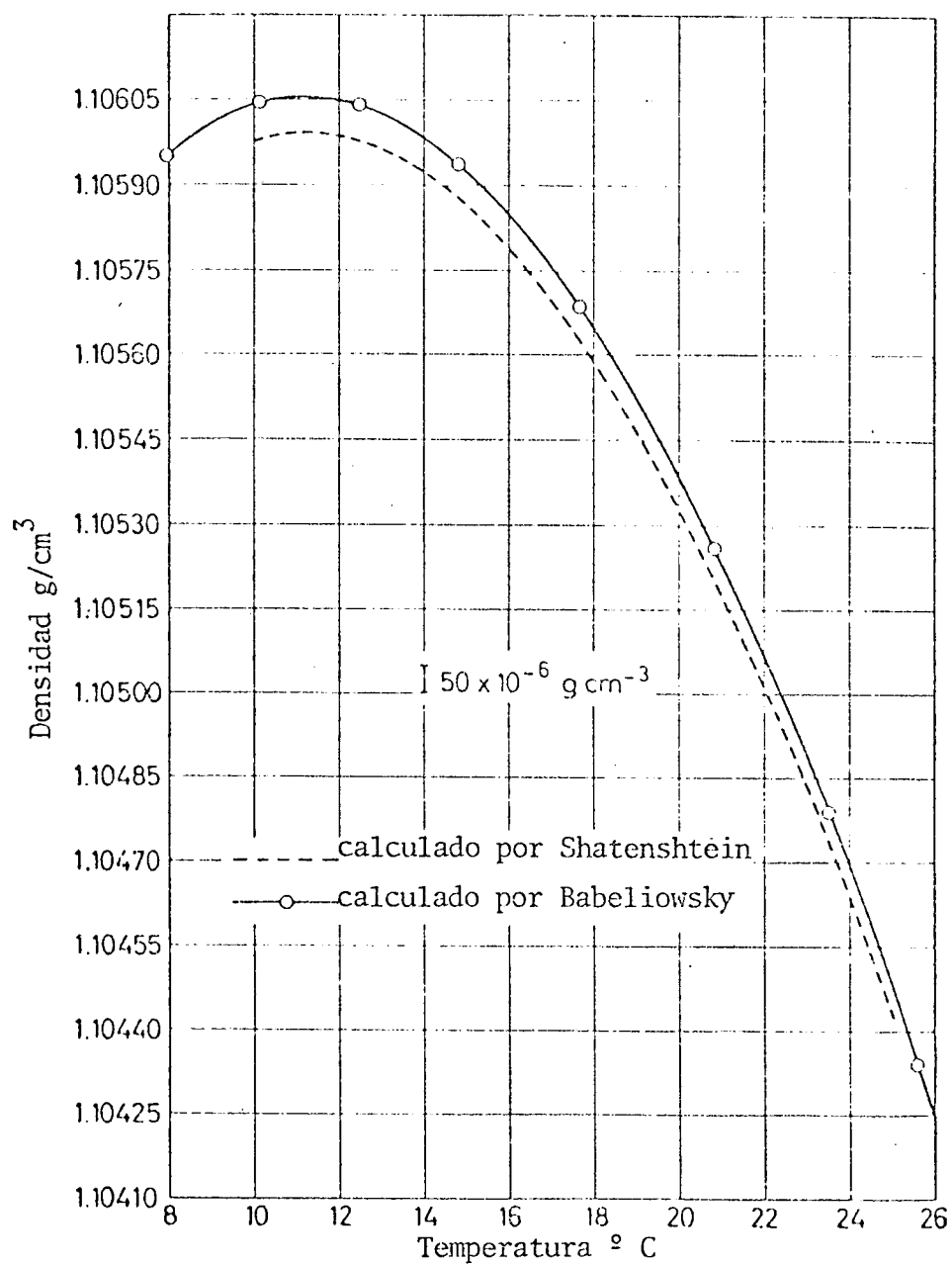
Kirshenbaum y otros	1.10449
Voskuy1, Barash	1.10448 ₀
Shatenstein y otros	1.10442 ₉
Wladimirski y otros	1.10444
	1.10446
	1.10448
Steckel, Szapiro	1.10444
Babeliowsky y otros	1.104481

18-p.106

TEMPERATURAS DE EQUILIBRIO DEL D₂O PURA
Y SUS CORRESPONDIENTES DENSIDADES

Flota- dor Nº	Temperatura de equilibrio ° C	Densidad g/cm ³
1	25.617 9 ± 5 · 10 ⁻⁴	1.104 344 ₀ ± 5 · 10 ⁻⁶
2	23.519 4 ± 5 · 10 ⁻⁴	1.104 785 ₁ ± 5 · 10 ⁻⁶
3	20.843 6 ± 5 · 10 ⁻⁴	1.105 262 ₃ ± 5 · 10 ⁻⁶
4	17.649 9 ± 5 · 10 ⁻⁴	1.105 689 ₆ ± 5 · 10 ⁻⁶
5	14.779 7 ± 5 · 10 ⁻⁴	1.105 933 ₇ ± 5 · 10 ⁻⁶
6	12.467 8 ± 5 · 10 ⁻⁴	1.106 039 ₂ ± 5 · 10 ⁻⁶
6	10.128 6 ± 5 · 10 ⁻⁴	1.106 047 ₂ ± 5 · 10 ⁻⁶
5	7.933 2 ± 5 · 10 ⁻⁴	1.105 948 ₄ ± 5 · 10 ⁻⁶

18-p.107



Temperaturas de equilibrios del D₂O pura y sus correspondientes densidades.

18-p.108

PROPIEDADES DEL VAPOR DEL D₂O

REFERENCIAS.

V: volumen específico

i: entalpía

L: calor latente de vaporización

S: entropía

U: energía interna

El subíndice s se refiere al líquido saturado, y el subíndice s con supraíndice 1 se refiere a vapor saturado.

Pres. Bar	Temp. °C	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg°K			Energ. Interna kJ/kg		
		V _s	ΔV	V _s	i _s	L	i _s	S _s	L/T	S _s	u _s	Δu	u _s
.007	4.36	.000905	162.37	162.37	2.31	2312.3	2312.1	.0083	8.3571	8.3554	2.31	2205.2	2207.5
.008	6.22	.000905	142.94	142.94	10.63	2314.1	2314.4	.0267	8.2742	8.3114	10.23	2195.8	2210.3
.009	7.69	.000905	127.74	127.74	17.31	2310.0	2327.3	.0619	6.2109	8.2723	17.30	2195.0	2212.3
.010	9.40	.000905	115.51	115.51	23.71	2306.2	2329.9	.0846	6.1936	8.2882	23.71	2190.7	2214.4
.012	12.05	.000905	97.102	97.103	34.95	2299.5	2334.5	.1241	6.0745	8.1786	34.95	2183.0	2218.0
.014	14.34	.000905	83.840	83.840	44.61	2293.6	2336.4	.1579	7.9705	8.1284	44.64	2176.4	2221.0
.016	16.36	.000905	73.847	73.848	53.15	2288.7	2341.9	.1873	7.8977	8.0890	53.15	2170.6	2223.7
.018	18.16	.000905	66.021	66.022	60.77	2284.2	2344.9	.2135	7.8333	8.0465	60.77	2165.4	2226.1
.020	19.79	.000905	59.734	59.735	67.67	2280.1	2347.7	.2371	7.7757	8.0123	67.67	2160.6	2228.3
.022	21.29	.000905	54.565	54.565	73.98	2276.3	2350.3	.2585	7.7235	7.9820	73.98	2155.3	2230.3
.024	22.67	.000905	50.237	50.236	79.81	2272.8	2352.6	.2782	7.6757	7.9539	79.81	2152.3	2232.1
.026	23.95	.000905	46.562	46.562	85.22	2269.6	2354.8	.2964	7.6317	7.9281	85.22	2148.5	2233.8
.028	25.15	.000905	43.407	43.408	90.27	2266.6	2356.8	.3134	7.5910	7.9043	90.26	2145.1	2235.3
.030	26.28	.000905	40.661	40.662	95.01	2263.7	2358.7	.3292	7.5530	7.8822	95.01	2141.8	2236.8
.032	27.34	.000905	38.248	38.249	99.49	2261.1	2360.5	.3441	7.5174	7.8615	99.48	2138.7	2238.2
.034	28.34	.000907	36.108	36.109	103.72	2258.5	2362.2	.3582	7.4839	7.8420	103.72	2135.7	2239.5
.036	29.30	.000907	34.213	34.214	107.74	2256.1	2363.3	.3714	7.4524	7.8238	107.73	2133.0	2240.7
.038	30.21	.000907	32.508	32.509	111.56	2253.8	2365.4	.3840	7.4225	7.8065	111.56	2130.3	2241.9
.040	31.08	.000907	30.963	30.964	115.22	2251.6	2366.6	.3961	7.3940	7.7901	115.22	2127.8	2243.0
.042	31.91	.000907	29.573	29.574	118.72	2249.5	2368.2	.4075	7.3671	7.7745	118.71	2125.3	2244.0
.044	32.71	.000907	28.297	28.298	122.08	2247.5	2369.6	.4185	7.3412	7.7597	122.07	2123.0	2245.1
.046	33.47	.000907	27.135	27.136	125.30	2245.5	2370.8	.4290	7.3166	7.7455	125.29	2120.7	2246.0
.048	34.21	.000908	26.067	26.068	128.40	2243.7	2372.1	.4391	7.2929	7.7320	128.39	2118.6	2247.0
.050	34.92	.000908	25.078	25.079	131.39	2241.9	2373.3	.4488	7.2702	7.7190	131.39	2116.5	2247.9
.060	38.15	.000909	21.115	21.116	144.95	2233.7	2378.6	.4885	7.1587	7.6611	144.94	2107.0	2251.9
.070	40.94	.000909	18.259	18.260	156.66	2226.6	2383.2	.5298	7.0825	7.6123	156.65	2098.8	2255.4
.080	43.40	.000910	16.099	16.100	167.00	2220.3	2387.3	.5696	7.0076	7.5701	166.99	2091.5	2258.5
.090	45.61	.000911	14.409	14.410	176.27	2214.6	2390.9	.5997	6.9413	7.5330	176.26	2085.0	2261.2
.100	47.62	.000911	13.050	13.051	184.68	2209.5	2394.2	.6180	6.8819	7.4999	184.67	2079.0	2263.7
.110	49.46	.000912	11.930	11.931	192.41	2204.8	2397.2	.6340	6.8280	7.4700	192.40	2073.5	2265.9
.120	51.17	.000913	10.994	10.995	199.54	2200.4	2399.9	.6480	6.7787	7.4427	199.53	2068.5	2268.0
.130	52.75	.000913	10.197	10.198	206.19	2196.3	2402.5	.6604	6.7332	7.4176	206.17	2063.8	2269.9
.140	54.24	.000914	9.5134	9.5143	212.40	2192.5	2404.9	.6733	6.6911	7.3945	212.33	2059.3	2271.7
.150	55.63	.000914	8.9158	8.9167	218.25	2188.9	2407.2	.6811	6.6518	7.3729	218.23	2055.2	2273.4
.160	56.95	.000915	8.3932	8.3941	223.76	2185.5	2409.3	.6879	6.6149	7.3528	223.75	2051.2	2275.0
.170	58.20	.000915	7.9287	7.9296	229.00	2182.3	2411.3	.6937	6.5803	7.3339	228.93	2047.5	2276.5
.180	59.39	.000916	7.5148	7.5157	233.97	2179.2	2413.2	.6986	6.5475	7.3161	233.96	2043.9	2277.9
.190	60.53	.000916	7.1426	7.1436	238.72	2176.3	2415.0	.7028	6.5164	7.2993	238.70	2040.5	2279.2
.200	61.61	.000917	6.8080	6.8089	243.25	2173.4	2416.7	.7064	6.4870	7.2833	243.23	2037.3	2280.5
.220	63.65	.000918	6.2273	6.2282	251.77	2168.2	2419.9	.7217	6.4321	7.2538	251.75	2031.2	2282.9
.240	65.53	.000919	5.7391	5.7400	259.65	2163.3	2422.9	.7350	6.3818	7.2269	259.63	2025.5	2285.2
.260	67.29	.000920	5.3254	5.3264	266.99	2158.7	2425.7	.7466	6.3355	7.2021	266.97	2020.2	2287.2
.280	68.94	.000921	4.9686	4.9695	273.87	2154.4	2428.3	.7567	6.2925	7.1792	273.84	2015.3	2289.1
.300	70.49	.000921	4.6580	4.6589	280.34	2150.3	2430.7	.7656	6.2523	7.1579	280.31	2010.6	2290.9
.320	71.95	.000922	4.3837	4.3846	286.45	2146.5	2433.0	.7733	6.2148	7.1351	286.42	2006.2	2292.6
.340	73.34	.000923	4.1433	4.1442	292.26	2142.9	2435.1	.7800	6.1793	7.1194	292.23	2002.0	2294.2
.360	74.66	.000924	3.9224	3.9233	297.77	2139.4	2437.2	.7859	6.1459	7.1018	297.74	1998.0	2295.7
.380	75.92	.000924	3.7348	3.7358	303.04	2136.1	2439.1	.7910	6.1142	7.0832	303.00	1994.2	2297.2

Pres. Bar	Temp. °C	Volumen m ³ /kg			Entalpia kJ/kg			Entropia kJ/kg·°K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u _s	Δu	u ¹ _s
.430	77.13	.000925	3.5539	3.5506	308.08	2132.9	2441.0	.9854	6.0841	7.0695	308.04	1950.5	2258.6
.440	76.29	.000926	3.4010	3.4019	312.91	2123.9	2442.6	.9951	6.0554	7.0745	312.07	1937.0	2259.9
.440	79.40	.000927	3.2907	3.2577	317.55	2126.9	2444.5	1.0123	6.0050	7.0403	317.51	1933.6	2301.1
.460	60.47	.000927	3.1244	3.1251	322.01	2124.1	2446.1	1.0249	6.0019	7.0207	321.97	1930.4	2302.4
.480	61.51	.000926	3.0026	3.0035	326.31	2121.4	2447.7	1.0370	5.9700	7.0137	326.27	1977.3	2303.5
.500	62.50	.000929	2.8906	2.8915	330.47	2116.7	2449.2	1.0487	5.9525	7.0012	330.42	1974.2	2304.6
.520	63.47	.000929	2.7855	2.7874	334.49	2116.2	2450.7	1.0609	5.9293	6.9892	334.44	1971.3	2305.7
.540	64.40	.000930	2.6899	2.6908	338.58	2113.7	2452.1	1.0709	5.9000	6.9777	338.53	1963.5	2306.8
.560	65.31	.000930	2.6004	2.6013	342.15	2111.3	2453.6	1.0824	5.8655	6.9657	342.10	1955.7	2307.8
.580	66.19	.000931	2.5163	2.5172	345.62	2109.0	2454.8	1.0916	5.8244	6.9560	345.76	1963.0	2308.8
.600	67.04	.000932	2.4382	2.4391	349.37	2106.7	2456.1	1.1014	5.8442	6.9457	349.32	1960.4	2309.7
.620	67.87	.000932	2.3646	2.3656	352.81	2104.5	2457.3	1.1110	5.8246	6.9356	352.78	1957.9	2310.7
.640	68.68	.000933	2.2957	2.2966	356.20	2102.3	2458.5	1.1209	5.8057	6.9260	356.14	1955.4	2311.6
.660	69.47	.000933	2.2305	2.2314	359.48	2100.2	2459.7	1.1304	5.7873	6.9167	359.42	1953.0	2312.4
.680	70.23	.000934	2.1695	2.1704	362.68	2098.2	2460.9	1.1398	5.7694	6.9076	362.62	1950.7	2313.3
.700	70.98	.000935	2.1114	2.1123	365.80	2096.2	2462.0	1.1487	5.7521	6.8988	365.74	1948.4	2314.1
.720	71.72	.000935	2.0568	2.0577	368.85	2094.2	2463.1	1.1571	5.7352	6.8903	368.78	1946.2	2314.9
.740	72.43	.000936	2.0049	2.0058	371.83	2092.3	2464.1	1.1652	5.7186	6.8820	371.76	1944.0	2315.7
.760	73.13	.000936	1.9556	1.9565	374.74	2090.4	2465.2	1.1712	5.7027	6.8739	374.67	1941.8	2316.5
.780	73.82	.000937	1.9087	1.9095	377.59	2088.6	2466.2	1.1789	5.6871	6.8660	377.52	1939.7	2317.3
.800	74.49	.000937	1.8641	1.8651	380.36	2086.8	2467.2	1.1866	5.6719	6.8584	380.30	1937.7	2318.0
.820	75.14	.000938	1.8218	1.8228	383.11	2085.1	2468.1	1.1939	5.6570	6.8509	383.03	1935.7	2318.7
.840	75.78	.000938	1.7813	1.7823	385.78	2083.5	2469.1	1.2012	5.6425	6.8436	385.70	1933.7	2319.4
.860	76.41	.000939	1.7426	1.7436	388.41	2081.9	2470.0	1.2083	5.6283	6.8365	388.33	1931.8	2320.1
.880	77.03	.000939	1.7057	1.7067	390.98	2080.0	2471.0	1.2152	5.6144	6.8296	390.90	1929.9	2320.6
.900	77.64	.000940	1.6702	1.6712	393.51	2078.3	2471.8	1.2220	5.6008	6.8228	393.42	1928.0	2321.4
.920	78.24	.000940	1.6363	1.6373	395.99	2076.7	2472.7	1.2287	5.5875	6.8162	395.90	1926.2	2322.1
.940	78.82	.000941	1.6038	1.6047	398.43	2075.1	2473.6	1.2352	5.5744	6.8097	398.34	1924.4	2322.7
.960	79.40	.000941	1.5726	1.5735	400.82	2073.6	2474.4	1.2417	5.5617	6.8033	400.73	1922.6	2323.4
.980	79.96	.000942	1.5427	1.5436	403.17	2072.1	2475.2	1.2480	5.5491	6.7971	403.08	1920.9	2324.0
1.000	100.52	.000942	1.5139	1.5148	405.48	2070.6	2476.1	1.2541	5.5369	6.7910	405.39	1919.2	2324.6
1.100	103.17	.000944	1.3652	1.3661	416.50	2063.4	2479.9	1.2655	5.4789	6.7624	416.40	1911.0	2327.4
1.200	105.63	.000946	1.2771	1.2780	426.72	2056.7	2483.4	1.3105	5.4250	6.7363	426.61	1903.5	2330.1
1.300	107.92	.000948	1.1852	1.1862	436.26	2050.5	2486.7	1.3356	5.3767	6.7123	436.14	1896.4	2332.5
1.400	110.08	.000950	1.1060	1.1070	445.22	2044.6	2489.6	1.3550	5.3311	6.6901	445.09	1889.7	2334.8
1.500	112.11	.000952	1.0370	1.0380	453.67	2039.0	2492.7	1.3693	5.2886	6.6696	453.52	1883.5	2337.0
1.600	114.03	.000953	.97833	.97734	461.66	2033.7	2495.4	1.4016	5.2437	6.6503	461.51	1877.5	2339.0
1.700	115.86	.000955	.92267	.92362	469.26	2028.7	2497.9	1.4212	5.2111	6.6323	469.10	1871.8	2340.9
1.800	117.60	.000956	.87466	.87562	476.50	2023.9	2500.4	1.4397	5.1756	6.6153	476.33	1866.4	2342.8
1.900	119.27	.000958	.83155	.83251	483.42	2019.3	2502.7	1.4574	5.1419	6.5993	483.24	1861.3	2344.5
2.000	120.66	.000959	.79267	.79363	490.05	2014.8	2504.9	1.4742	5.1093	6.5840	489.86	1856.3	2346.2
2.100	122.40	.000960	.75729	.75825	496.42	2010.6	2507.0	1.4903	5.0793	6.5696	496.22	1851.5	2347.8
2.200	123.87	.000962	.72497	.72593	502.55	2006.4	2509.0	1.5057	5.0501	6.5558	502.34	1846.9	2349.3
2.300	125.29	.000963	.69551	.69647	508.45	2002.5	2510.9	1.5206	5.0222	6.5427	508.23	1842.5	2350.7
2.400	126.66	.000964	.66836	.66933	514.15	1998.6	2512.8	1.5348	4.9953	6.5302	513.92	1838.2	2352.1
2.500	127.98	.000965	.64337	.64433	519.66	1994.9	2514.6	1.5486	4.9696	6.5181	519.41	1834.1	2353.5
2.600	129.27	.000967	.62010	.62107	524.99	1991.3	2516.3	1.5613	4.9443	6.5066	524.74	1830.1	2354.8
2.700	130.51	.000968	.59856	.59953	530.16	1987.8	2517.9	1.5746	4.9209	6.4955	529.90	1826.2	2356.1
2.800	131.72	.000969	.57853	.57950	535.16	1984.4	2519.5	1.5870	4.8972	6.4848	534.91	1822.4	2357.3
2.900	132.89	.000970	.55985	.56082	540.06	1981.0	2521.1	1.5990	4.8755	6.4745	539.78	1818.7	2358.5

Pres. Bar	Temp. °C	Volumen m ³ /kg			Entalpia kJ/kg			Entropia kJ/kg °K			Energ. Interna kJ/kg		
		V _s	ΔV	V _{1s}	i _s	l	i _{1s}	S _s	L/T	S _{1s}	u _s	Δu	u _{1s}
3.000	134.03	.000971	.54232	.54329	544.81	1977.8	2522.6	1.6107	4.6539	6.4546	544.51	1815.1	2359.6
3.100	135.14	.000972	.52937	.52635	549.42	1974.6	2524.1	1.6228	4.6530	6.4550	549.12	1811.6	2360.8
3.200	136.22	.000973	.52045	.51142	553.93	1971.6	2525.5	1.6330	4.6527	6.4557	553.61	1808.2	2361.8
3.300	137.26	.000974	.49590	.49607	558.32	1968.5	2526.9	1.6437	4.6520	6.4567	558.00	1804.9	2362.9
3.400	138.31	.000975	.48210	.48313	562.60	1965.6	2528.2	1.6541	4.6518	6.4579	562.27	1801.7	2363.9
3.500	139.31	.000976	.46928	.47026	566.79	1962.7	2529.5	1.6643	4.6522	6.4585	566.45	1798.5	2364.9
3.600	140.29	.000977	.45702	.45799	570.86	1959.9	2530.8	1.6742	4.6521	6.4583	570.53	1795.4	2365.9
3.700	141.25	.000978	.44538	.44636	574.83	1957.1	2532.0	1.6838	4.6515	6.4583	574.52	1792.3	2366.8
3.800	142.19	.000979	.43435	.43533	578.80	1954.4	2533.2	1.6932	4.6503	6.4585	578.43	1789.3	2367.8
3.900	143.11	.000980	.42390	.42488	582.53	1951.7	2534.4	1.7024	4.6495	6.4579	582.25	1786.4	2368.7
4.000	144.01	.000980	.41388	.41486	586.39	1949.1	2535.5	1.7115	4.6491	6.4585	586.00	1783.6	2369.6
4.200	145.75	.000982	.39532	.39630	593.69	1944.0	2537.7	1.7289	4.6475	6.4564	593.28	1778.0	2371.7
4.400	147.45	.000984	.37838	.37936	600.72	1939.1	2539.8	1.7458	4.6473	6.4529	600.29	1772.5	2372.5
4.600	149.07	.000985	.36289	.36387	607.30	1934.4	2541.9	1.7617	4.6483	6.4500	607.05	1767.4	2374.5
4.800	150.64	.000987	.34876	.34955	614.05	1929.8	2543.8	1.7772	4.6495	6.4577	613.55	1762.4	2376.0
5.000	152.15	.000988	.33544	.33643	620.40	1925.3	2545.7	1.7921	4.6527	6.4550	619.90	1757.5	2377.5
5.200	153.62	.000990	.32324	.32423	626.54	1920.9	2547.5	1.8068	4.6530	6.4545	626.03	1752.3	2378.9
5.400	155.05	.000991	.31191	.31290	632.51	1916.7	2549.2	1.8204	4.6532	6.4536	631.97	1748.3	2380.2
5.600	156.43	.000993	.30137	.30236	638.30	1912.6	2550.9	1.8339	4.6542	6.4531	637.74	1744.3	2381.5
5.800	157.77	.000994	.29152	.29251	643.94	1908.5	2552.5	1.8470	4.6560	6.4530	643.35	1739.4	2382.8
6.000	159.08	.000995	.28234	.28334	649.42	1904.6	2554.0	1.8597	4.6555	6.4532	648.82	1735.2	2384.0
6.200	160.35	.000997	.27370	.27469	654.76	1900.8	2555.5	1.8720	4.6512	6.4535	654.15	1731.1	2385.2
6.400	161.55	.000998	.26561	.26660	659.93	1897.0	2557.0	1.8840	4.6507	6.4547	659.34	1727.0	2386.4
6.600	162.80	.000999	.25793	.25893	665.07	1893.3	2558.4	1.8957	4.6501	6.4538	664.41	1723.1	2387.5
6.800	163.98	.001001	.25076	.25176	670.04	1889.7	2559.8	1.9071	4.6502	6.4573	669.35	1719.2	2388.6
7.000	165.14	.001002	.24399	.24499	674.90	1886.2	2561.1	1.9181	4.6508	6.4589	674.12	1715.5	2389.7
7.200	166.26	.001003	.23750	.23850	679.65	1882.8	2562.4	1.9289	4.6519	6.4583	678.93	1711.8	2390.7
7.400	167.37	.001004	.23142	.23243	684.30	1879.4	2563.7	1.9395	4.6535	6.4530	683.56	1708.1	2391.7
7.600	168.45	.001005	.22560	.22660	688.85	1876.0	2564.9	1.9498	4.6555	6.4534	688.10	1704.6	2392.7
7.800	169.51	.001007	.22008	.22107	693.33	1872.8	2566.1	1.9599	4.6580	6.4579	692.55	1701.1	2393.7
8.000	170.54	.001008	.21479	.21580	697.71	1869.6	2567.3	1.9698	4.6509	6.4587	696.91	1697.7	2394.6
8.200	171.56	.001009	.20989	.21090	702.01	1866.4	2568.4	1.9795	4.6542	6.4577	701.13	1694.3	2395.5
8.400	172.55	.001010	.20510	.20611	706.23	1863.3	2569.5	1.9889	4.6578	6.4563	705.38	1691.0	2396.4
8.600	173.53	.001011	.20053	.20154	710.37	1860.2	2570.6	1.9982	4.6613	6.4560	709.50	1687.8	2397
8.800	174.49	.001012	.19619	.19721	714.45	1857.2	2571.6	2.0073	4.6652	6.4555	713.56	1684.5	2398
9.000	175.43	.001013	.19201	.19302	718.45	1854.2	2572.7	2.0162	4.6703	6.4571	717.54	1681.4	2399.0
9.200	175.36	.001014	.18803	.18905	722.38	1851.3	2573.7	2.0250	4.6758	6.4563	721.45	1678.3	2399.8
9.400	177.27	.001015	.18420	.18521	726.25	1848.4	2574.7	2.0336	4.6811	6.4547	725.30	1675.3	2400.6
9.600	178.17	.001016	.18054	.18155	730.06	1845.6	2575.5	2.0420	4.6867	6.4537	729.09	1672.3	2401.3
9.800	179.05	.001017	.17699	.17801	733.81	1842.8	2576.6	2.0503	4.6925	6.4528	732.82	1669.3	2402.1
10.000	179.91	.001018	.17363	.17465	737.51	1840.0	2577.5	2.0585	4.6986	6.4517	736.49	1666.4	2402.8
10.200	180.77	.001019	.17035	.17137	741.15	1837.2	2578.4	2.0665	4.7049	6.4514	740.11	1663.5	2403.6
10.400	181.61	.001020	.16723	.16825	744.74	1834.5	2579.3	2.0744	4.7115	6.4509	743.67	1660.6	2404.3
10.600	182.44	.001021	.16418	.16520	748.27	1831.9	2580.1	2.0821	4.7184	6.4505	747.19	1657.8	2405.0
10.800	183.25	.001022	.16123	.16230	751.76	1829.2	2581.0	2.0898	4.7254	6.4501	750.65	1655.0	2405.7
11.000	184.05	.001023	.15846	.15948	755.20	1826.6	2581.8	2.0973	4.7327	6.4509	754.07	1652.3	2406.4
11.200	184.85	.001024	.15574	.15676	758.59	1824.0	2582.6	2.1047	4.7401	6.4548	757.44	1649.6	2407.1
11.400	185.63	.001025	.15311	.15414	761.93	1821.5	2583.4	2.1120	4.7478	6.4598	760.77	1646.9	2407.7
11.600	186.40	.001026	.15057	.15160	765.24	1819.0	2584.2	2.1192	4.7557	6.4649	764.05	1644.3	2408.4
11.800	187.16	.001027	.14812	.14915	768.50	1816.5	2585.0	2.1262	4.7637	6.4700	767.29	1641.7	2409.0

Pres. Bar	Temp. °C	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg°K			Energ. Interna kJ/kg		
		V _S	ΔV	V _{1S}	i _S	L	i _{1S}	S _S	L/T	S _{1S}	u	Δu	u _{1S}
12.000	187.91	.001026	.14375	.14678	771.73	1814.0	2507.7	2.1332	3.9320	6.0652	770.48	1639.1	2409.6
12.200	188.65	.001029	.14393	.14695	774.91	1811.6	2508.5	2.1401	3.9214	6.0695	773.65	1636.6	2410.2
12.400	189.38	.001030	.14415	.14722	778.66	1809.1	2509.2	2.1469	3.9107	6.0739	776.78	1634.1	2410.9
12.600	190.10	.001031	.13936	.14009	781.16	1806.7	2509.9	2.1538	3.8997	6.0784	779.86	1631.5	2411.4
12.800	190.81	.001031	.13695	.13798	784.23	1804.4	2508.6	2.1601	3.8887	6.0829	782.91	1629.1	2412.0
13.000	191.52	.001032	.13492	.13595	787.37	1802.0	2509.3	2.1666	3.8777	6.0875	785.93	1626.6	2412.6
13.200	192.21	.001033	.13293	.13296	790.20	1799.7	2506.0	2.1732	3.8669	6.0921	788.91	1624.2	2413.1
13.400	192.90	.001034	.13104	.13207	793.28	1797.4	2506.6	2.1799	3.8563	6.0967	791.88	1621.8	2413.7
13.600	193.58	.001035	.12917	.13020	796.19	1795.1	2507.3	2.1865	3.8458	6.0997	794.78	1619.5	2414.2
13.800	194.25	.001036	.12735	.12839	799.09	1792.8	2509.9	2.1921	3.8354	6.0955	797.66	1617.1	2414.8
14.000	194.91	.001037	.12560	.12664	801.97	1790.6	2502.6	2.1983	3.8252	6.0915	800.52	1614.8	2415.3
14.200	195.57	.001038	.12384	.12488	804.82	1788.4	2503.2	2.2047	3.8151	6.0875	803.35	1612.5	2415.9
14.400	196.22	.001039	.12222	.12326	807.64	1786.2	2503.8	2.2103	3.8051	6.0835	806.14	1610.2	2416.3
14.600	196.86	.001039	.12060	.12164	810.43	1784.0	2504.4	2.2161	3.7953	6.0796	808.91	1607.9	2416.8
14.800	197.50	.001040	.11901	.12005	813.19	1781.8	2505.0	2.2221	3.7856	6.0757	811.65	1605.7	2417.3
15.000	198.12	.001041	.11747	.11851	815.93	1779.7	2505.6	2.2279	3.7760	6.0719	814.37	1603.5	2417.8
15.200	198.75	.001042	.11598	.11702	818.64	1777.5	2506.2	2.2337	3.7665	6.0681	817.05	1601.2	2418.3
15.400	199.36	.001043	.11451	.11555	821.32	1775.4	2506.7	2.2394	3.7571	6.0644	819.72	1599.1	2418.8
15.600	199.97	.001043	.11307	.11412	823.98	1773.3	2507.3	2.2450	3.7478	6.0608	822.36	1596.9	2419.3
15.800	200.58	.001044	.11170	.11275	826.62	1771.2	2507.8	2.2505	3.7386	6.0572	824.97	1594.7	2419.7
16.000	201.17	.001045	.11032	.11137	829.23	1769.1	2508.4	2.2560	3.7295	6.0536	827.56	1592.6	2420.2
16.200	201.77	.001046	.10900	.11005	831.82	1767.1	2508.9	2.2615	3.7205	6.0501	830.13	1590.5	2420.6
16.400	202.35	.001047	.10772	.10877	834.39	1765.0	2509.4	2.2670	3.7117	6.0466	832.67	1588.4	2421.1
16.600	202.93	.001048	.10646	.10751	836.93	1763.0	2509.9	2.2724	3.7030	6.0432	835.19	1586.3	2421.5
16.800	203.51	.001048	.10524	.10629	839.45	1761.0	2509.5	2.2775	3.6943	6.0398	837.69	1584.2	2421.9
17.000	204.08	.001049	.10400	.10505	841.96	1759.0	2509.0	2.2826	3.6856	6.0364	840.17	1582.2	2422.4
17.200	204.64	.001050	.10283	.10388	844.44	1757.0	2509.4	2.2879	3.6771	6.0331	842.63	1580.1	2422.8
17.400	205.20	.001051	.10169	.10274	846.90	1755.0	2509.9	2.2931	3.6687	6.0298	845.07	1578.1	2423.2
17.600	205.76	.001052	.10054	.10159	849.34	1753.0	2509.4	2.2983	3.6603	6.0265	847.49	1576.1	2423.6
17.800	206.31	.001052	.09943	.10048	851.76	1751.0	2508.8	2.3032	3.6520	6.0232	849.89	1574.1	2424.0
18.000	206.85	.001053	.09837	.09942	854.16	1749.1	2509.2	2.3082	3.6437	6.0200	852.27	1572.0	2424.3
18.200	207.39	.001054	.09729	.09835	856.55	1747.1	2509.6	2.3132	3.6355	6.0167	854.63	1570.0	2424.6
18.400	207.93	.001055	.09628	.09734	858.91	1745.1	2509.0	2.3181	3.6273	6.0134	856.97	1567.9	2424.9
18.600	208.46	.001055	.09524	.09629	861.26	1743.1	2509.4	2.3230	3.6192	6.0102	859.30	1565.9	2425.3
18.800	208.98	.001056	.09426	.09532	863.59	1741.1	2509.7	2.3278	3.6111	6.0070	861.60	1563.9	2425.5
19.000	209.51	.001057	.09326	.09432	865.90	1739.2	2509.1	2.3326	3.6031	6.0037	863.89	1562.0	2425.8
19.200	210.03	.001058	.09230	.09336	868.20	1737.2	2509.4	2.3373	3.5952	6.0005	866.17	1560.0	2426.1
19.400	210.54	.001059	.09138	.09244	870.48	1735.2	2509.7	2.3420	3.5873	6.0073	868.42	1557.9	2426.4
19.600	211.05	.001059	.09046	.09152	872.74	1733.2	2509.0	2.3467	3.5795	6.0042	870.66	1555.9	2426.6
19.800	211.55	.001060	.08956	.09062	874.99	1731.3	2508.3	2.3513	3.5717	6.0010	872.89	1553.9	2426.8
20.000	212.06	.001061	.08865	.08969	877.22	1729.3	2508.6	2.3559	3.5639	6.0079	875.10	1552.0	2427.1
21.000	214.51	.001065	.08447	.08554	888.15	1719.5	2507.7	2.3724	3.5240	6.0024	885.91	1542.1	2428.1
22.000	216.87	.001068	.08065	.08172	898.73	1709.6	2506.6	2.4000	3.4873	6.0073	896.38	1532.4	2428.8
23.000	219.16	.001072	.07713	.07820	908.99	1700.3	2509.3	2.4209	3.4517	6.0125	906.52	1522.9	2429.4
24.000	221.36	.001076	.07391	.07498	918.94	1690.8	2509.6	2.4410	3.4172	6.0182	916.36	1513.4	2429.8
25.000	223.50	.001079	.07092	.07199	928.63	1681.5	2510.1	2.4605	3.3837	6.0242	925.93	1504.2	2430.1
26.000	225.57	.001083	.06812	.06920	938.06	1672.3	2510.3	2.4795	3.3511	6.0306	935.24	1495.1	2430.4
27.000	227.59	.001086	.06556	.06665	947.24	1663.2	2510.4	2.4976	3.3196	6.0374	944.31	1486.2	2430.5
28.000	229.54	.001090	.06323	.06432	956.21	1654.2	2510.4	2.5157	3.2886	6.0445	953.16	1477.2	2430.3
29.000	231.44	.001093	.06096	.06205	964.97	1645.4	2510.3	2.5331	3.2580	6.0520	961.80	1468.6	2430.4

Pres. Bar	Temp. °C	Volumen m ³ /kg			Entalpia kJ/kg			Entropia kJ/kg°K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u _s	Δu	u ¹ _s
30.000	233.30	.001097	.05667	.05997	974.53	1637.0	2610.6	2.5500	3.2215	5.7805	970.24	1450.4	2430.7
31.000	235.11	.001100	.05595	.05805	981.51	1628.7	2610.6	2.5563	3.2127	5.7831	978.50	1452.2	2430.7
32.000	236.87	.001104	.05512	.05692	991.12	1620.3	2610.7	2.5626	3.2035	5.7852	986.59	1444.2	2430.8
33.000	238.59	.001107	.05437	.05443	998.16	1612.3	2610.5	2.5693	3.1944	5.7872	994.51	1436.2	2430.7
34.000	240.27	.001110	.05374	.05285	1000.05	1604.2	2610.3	2.6137	3.1852	5.7355	1002.27	1428.3	2420.6
35.000	241.92	.001114	.05322	.05153	1013.79	1596.5	2610.3	2.6267	3.0979	5.7266	1009.29	1420.8	2430.7
36.000	243.53	.001117	.04974	.04966	1021.39	1589.0	2610.3	2.6434	3.0736	5.7171	1017.37	1413.5	2430.8
37.000	245.10	.001120	.04779	.04851	1025.57	1581.5	2610.3	2.6573	3.0495	5.7077	1024.72	1406.1	2430.9
38.000	246.65	.001124	.04606	.04718	1030.21	1574.1	2610.3	2.6720	3.0247	5.6987	1031.64	1399.1	2431.0
39.000	248.16	.001127	.04435	.04558	1034.44	1566.8	2610.3	2.6859	3.0039	5.6898	1039.04	1391.9	2431.0
40.000	249.64	.001130	.04370	.04483	1050.55	1559.7	2610.2	2.6995	2.9817	5.6811	1046.02	1384.9	2430.9
41.000	251.10	.001134	.04257	.04370	1057.55	1552.5	2610.1	2.7128	2.9593	5.6727	1052.90	1378.0	2430.9
42.000	252.53	.001137	.04148	.04262	1064.45	1545.5	2609.9	2.7259	2.9384	5.6645	1059.67	1371.3	2431.0
43.000	253.93	.001140	.04046	.04160	1071.24	1538.5	2609.8	2.7388	2.9173	5.6562	1066.34	1364.5	2430.9
44.000	255.31	.001144	.03950	.04064	1077.34	1531.6	2609.5	2.7515	2.8966	5.6482	1072.91	1357.8	2430.7
45.000	256.67	.001148	.03854	.03968	1084.56	1524.7	2609.3	2.7640	2.8762	5.6403	1079.39	1351.3	2430.7
46.000	258.00	.001152	.03765	.03880	1091.68	1517.9	2609.0	2.7763	2.8562	5.6325	1085.78	1344.7	2430.5
47.000	259.32	.001155	.03680	.03795	1097.51	1511.1	2608.6	2.7884	2.8364	5.6248	1092.09	1338.3	2430.3
48.000	260.61	.001159	.03593	.03709	1103.86	1504.4	2608.2	2.8003	2.8170	5.6172	1098.30	1331.9	2430.2
49.000	261.88	.001163	.03517	.03633	1110.13	1497.7	2607.8	2.8120	2.7976	5.6097	1104.43	1325.4	2429.8
50.000	263.13	.001166	.03440	.03557	1116.32	1491.0	2607.3	2.8235	2.7780	5.6023	1110.49	1319.0	2429.5
51.000	264.36	.001170	.03367	.03484	1122.44	1484.4	2606.8	2.8349	2.7591	5.5950	1116.47	1312.7	2429.1
52.000	265.58	.001174	.03297	.03415	1128.48	1477.3	2606.3	2.8461	2.7410	5.5875	1122.38	1306.3	2428.7
53.000	266.78	.001177	.03229	.03347	1134.46	1471.2	2605.7	2.8572	2.7234	5.5806	1128.22	1300.1	2428.3
54.000	267.96	.001181	.03161	.03279	1140.37	1464.7	2605.0	2.8681	2.7053	5.5735	1134.00	1294.0	2428.0
55.000	269.12	.001184	.03097	.03215	1146.22	1458.1	2604.4	2.8789	2.6875	5.5664	1139.71	1287.8	2427.5
56.000	270.27	.001187	.03037	.03155	1152.00	1451.6	2603.6	2.8896	2.6698	5.5594	1145.35	1281.6	2426.9
57.000	271.40	.001191	.02975	.03094	1157.73	1445.1	2602.9	2.9001	2.6524	5.5525	1150.94	1275.5	2426.5
58.000	272.52	.001194	.02919	.03033	1163.39	1438.7	2602.0	2.9107	2.6351	5.5455	1156.47	1269.3	2426.0
59.000	273.63	.001198	.02863	.02983	1169.01	1432.2	2601.2	2.9207	2.6180	5.5387	1161.94	1263.3	2425.2
60.000	274.72	.001201	.02808	.02929	1174.56	1425.7	2600.3	2.9309	2.6010	5.5318	1167.36	1257.2	2424.6
61.000	275.79	.001204	.02756	.02876	1180.07	1419.3	2599.4	2.9409	2.5842	5.5251	1172.72	1251.2	2423.9
62.000	276.86	.001207	.02705	.02826	1185.53	1412.9	2598.4	2.9506	2.5675	5.5183	1178.04	1245.2	2423.2
63.000	277.91	.001211	.02655	.02776	1190.93	1406.5	2597.4	2.9606	2.5510	5.5116	1183.30	1239.2	2422.5
64.000	278.94	.001214	.02603	.02729	1196.29	1400.1	2596.3	2.9703	2.5346	5.5049	1188.52	1233.2	2421.7
65.000	279.97	.001217	.02551	.02683	1201.60	1393.7	2595.3	2.9799	2.5183	5.4982	1193.69	1227.2	2420.9
66.000	280.98	.001220	.02516	.02638	1206.87	1387.3	2594.1	2.9894	2.5022	5.4915	1198.82	1221.2	2420.1
67.000	281.99	.001224	.02470	.02593	1212.10	1380.9	2593.0	2.9988	2.4862	5.4850	1203.90	1215.4	2419.3
68.000	282.98	.001227	.02428	.02550	1217.28	1374.5	2591.8	3.0082	2.4703	5.4784	1208.94	1209.4	2418.3
69.000	283.96	.001230	.02385	.02508	1222.42	1368.1	2590.5	3.0174	2.4545	5.4719	1213.94	1203.6	2417.5
70.000	284.93	.001233	.02345	.02469	1227.53	1361.7	2589.3	3.0265	2.4383	5.4653	1218.90	1197.6	2416.5
72.000	286.24	.001239	.02267	.02391	1237.62	1349.0	2586.6	3.0445	2.4273	5.4584	1228.59	1185.8	2414.5
74.000	288.71	.001245	.02192	.02316	1247.57	1335.3	2583.9	3.0623	2.3771	5.4394	1238.75	1174.1	2412.5
76.000	290.54	.001252	.02122	.02247	1257.38	1323.6	2581.0	3.0797	2.3489	5.4266	1247.37	1162.3	2410.2
78.000	292.33	.001258	.02052	.02178	1267.07	1310.9	2577.9	3.0959	2.3189	5.4128	1257.26	1150.3	2408.1
80.000	294.09	.001264	.01990	.02117	1276.63	1298.1	2574.8	3.1137	2.2874	5.4011	1266.52	1138.9	2405.4
82.000	295.82	.001270	.01926	.02053	1286.08	1285.4	2571.5	3.1303	2.2551	5.3884	1275.67	1127.5	2403.2
84.000	297.52	.001276	.01867	.01994	1295.42	1272.7	2568.1	3.1467	2.2231	5.3758	1284.70	1115.9	2400.6
86.000	299.18	.001282	.01810	.01939	1304.66	1260.0	2564.6	3.1629	2.2004	5.3632	1293.64	1104.3	2397.9
88.000	300.82	.001288	.01755	.01884	1313.81	1247.2	2561.0	3.1788	2.1719	5.3507	1302.47	1092.8	2395.2

Pres. Bar	Temp. °C	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg·K			Energ. Interna kJ/kg		
		V _s	ΔV	V _{1s}	i _s	L	i _{1s}	S _s	L/T	S _{1s}	u	Δu	u _{1s}
90.000	302.42	.001294	.01703	.01832	1322.86	1234.5	2357.3	3.1783	2.1147	5.4362	1311.21	1021.2	2332.5
92.000	304.00	.001300	.01693	.01783	1331.83	1231.7	2352.5	3.1801	2.1157	5.4350	1319.86	1069.6	2329.5
94.000	305.58	.001306	.01684	.01734	1340.71	1228.9	2349.6	3.1819	2.1167	5.4338	1328.43	1058.2	2326.6
96.000	307.16	.001313	.01677	.01689	1349.53	1226.1	2346.7	3.1837	2.1177	5.4326	1336.92	1046.6	2323.6
98.000	308.74	.001319	.01672	.01644	1358.25	1223.3	2343.6	3.1855	2.1187	5.4314	1345.33	1035.2	2320.5
100.00	310.37	.001325	.01669	.01601	1366.93	1220.5	2337.4	3.1873	2.1197	5.4305	1353.67	1023.6	2327.3
102.00	311.93	.001331	.01666	.01551	1375.57	1217.7	2332.2	3.1891	2.1207	5.4293	1361.97	1012.1	2324.0
104.00	312.96	.001337	.01666	.01520	1384.17	1214.8	2328.0	3.1909	2.1217	5.4280	1370.16	1000.7	2320.8
106.00	314.35	.001343	.01666	.01486	1392.59	1211.9	2324.5	3.1927	2.1227	5.4269	1378.32	989.2	2317.5
108.00	315.77	.001350	.01666	.01443	1400.99	1209.0	2320.0	3.1945	2.1237	5.4257	1386.41	977.7	2314.1
110.00	317.14	.001356	.01671	.01406	1409.33	1206.1	2315.4	3.1963	2.1247	5.4255	1394.46	966.3	2310.7
112.00	318.49	.001362	.01676	.01372	1417.51	1203.1	2310.8	3.1981	2.1257	5.4256	1402.46	954.6	2307.1
114.00	319.82	.001369	.01681	.01338	1425.61	1200.1	2306.1	3.1999	2.1267	5.4255	1410.41	942.8	2303.6
116.00	321.14	.001375	.01686	.01306	1433.62	1197.1	2301.4	3.2017	2.1277	5.4255	1418.32	931.6	2299.9
118.00	322.43	.001382	.01693	.01273	1441.54	1194.0	2296.5	3.2035	2.1287	5.4255	1426.19	920.1	2296.3
120.00	323.71	.001388	.01693	.01242	1449.38	1191.0	2291.6	3.2053	2.1297	5.4255	1434.02	908.6	2292.6
122.00	324.97	.001395	.01693	.01213	1457.13	1187.8	2286.7	3.2071	2.1307	5.4256	1441.83	896.9	2288.7
124.00	326.22	.001401	.01693	.01183	1464.89	1184.7	2281.7	3.2089	2.1317	5.4257	1449.61	885.4	2284.9
126.00	327.44	.001406	.01693	.01154	1472.59	1181.5	2276.6	3.2107	2.1327	5.4258	1457.36	873.9	2281.1
128.00	328.66	.001413	.01693	.01126	1480.20	1178.3	2271.5	3.2125	2.1337	5.4259	1465.09	862.3	2277.4
130.00	329.85	.001422	.01693	.01099	1487.82	1175.0	2266.3	3.2143	2.1347	5.4260	1472.80	850.6	2273.4
132.00	331.03	.001429	.01693	.01071	1495.35	1171.6	2261.0	3.2161	2.1357	5.4262	1480.40	839.1	2269.6
134.00	332.20	.001436	.01693	.01047	1502.89	1168.3	2255.7	3.2179	2.1367	5.4263	1487.99	827.2	2265.4
136.00	333.35	.001443	.01693	.01022	1510.34	1165.0	2250.3	3.2197	2.1377	5.4264	1495.56	815.4	2261.3
138.00	334.48	.001450	.01693	.00998	1517.80	1161.7	2244.9	3.2215	2.1387	5.4265	1503.11	803.6	2257.1
140.00	335.61	.001457	.01693	.00974	1525.26	1158.3	2239.4	3.2233	2.1397	5.4266	1510.66	791.8	2253.0
142.00	336.71	.001465	.01693	.00951	1532.68	1154.9	2233.9	3.2251	2.1407	5.4267	1518.19	780.0	2248.9
144.00	337.81	.001472	.01693	.00929	1540.09	1151.5	2228.3	3.2269	2.1417	5.4268	1525.71	768.0	2244.5
146.00	338.89	.001479	.01693	.00906	1547.48	1148.1	2222.6	3.2287	2.1427	5.4269	1533.21	756.0	2240.2
148.00	339.96	.001487	.01693	.00885	1554.87	1144.7	2216.9	3.2305	2.1437	5.4270	1540.69	743.9	2235.9
150.00	341.02	.001495	.01693	.00864	1562.26	1141.3	2211.1	3.2323	2.1447	5.4271	1548.16	731.7	2227.1
152.00	342.06	.001502	.01693	.00843	1569.62	1137.9	2205.2	3.2341	2.1457	5.4272	1555.61	719.7	2222.7
154.00	343.09	.001510	.01693	.00823	1576.98	1134.5	2199.3	3.2359	2.1467	5.4273	1563.04	707.4	2218.2
156.00	344.11	.001518	.01693	.00803	1584.33	1131.1	2193.3	3.2377	2.1477	5.4274	1570.46	695.0	2213.8
158.00	345.12	.001526	.01693	.00784	1591.68	1127.7	2187.3	3.2395	2.1487	5.4275	1577.87	682.6	2209.5
160.00	346.11	.001534	.01693	.00765	1600.00	1124.3	2181.1	3.2413	2.1497	5.4276	1585.27	669.9	2205.7
162.00	347.10	.001543	.01693	.00746	1608.31	1120.9	2174.9	3.2431	2.1507	5.4277	1592.66	657.4	2201.4
164.00	348.07	.001551	.01693	.00729	1616.62	1117.5	2168.7	3.2449	2.1517	5.4278	1600.04	644.4	2197.2
166.00	349.03	.001559	.01693	.00709	1624.93	1114.1	2162.5	3.2467	2.1527	5.4279	1607.41	631.6	2193.0
168.00	349.98	.001568	.01693	.00691	1633.24	1110.7	2156.3	3.2485	2.1537	5.4280	1614.77	618.7	2188.8
170.00	350.92	.001576	.01693	.00675	1641.55	1107.3	2150.3	3.2503	2.1547	5.4281	1622.12	605.2	2184.6
172.00	351.85	.001585	.01693	.00658	1649.86	1103.9	2144.2	3.2521	2.1557	5.4282	1629.46	591.8	2180.4
174.00	352.77	.001593	.01693	.00641	1658.17	1100.5	2138.0	3.2539	2.1567	5.4283	1636.79	578.3	2176.2
176.00	353.68	.001602	.01693	.00624	1666.48	1097.1	2131.9	3.2557	2.1577	5.4284	1644.11	564.6	2172.0
178.00	354.58	.001611	.01693	.00607	1674.79	1093.7	2125.7	3.2575	2.1587	5.4285	1651.42	550.5	2167.8
180.00	355.46	.001620	.01693	.00591	1683.10	1090.3	2119.5	3.2593	2.1597	5.4286	1658.72	536.4	2163.6
182.00	356.34	.001629	.01693	.00574	1691.41	1086.9	2113.3	3.2611	2.1607	5.4287	1666.01	521.9	2159.4
184.00	357.21	.001638	.01693	.00557	1699.72	1083.5	2107.1	3.2629	2.1617	5.4288	1673.29	507.2	2155.2
186.00	358.06	.001647	.01693	.00542	1708.03	1080.1	2100.9	3.2647	2.1627	5.4289	1680.56	492.0	2151.0
188.00	358.91	.001656	.01693	.00526	1716.34	1076.7	2094.7	3.2665	2.1637	5.4290	1687.82	476.6	2146.8

Pres. Bar	Temp. °C	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg°K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u	Δu	u ¹ _s
190.00	359.74	.001665	.00343	.00509	1751.49	926.0	2277.5	3.8397	.8307	4.7304	1719.85	460.9	2180.7
192.00	360.57	.001675	.00325	.00493	1762.21	927.3	2269.5	3.9166	.8001	4.7167	1730.04	444.7	2174.8
194.00	361.38	.001691	.00309	.00478	1773.27	928.9	2261.2	3.9940	.7666	4.7026	1740.45	428.0	2168.5
196.00	362.18	.001713	.00291	.00462	1784.64	930.0	2252.7	3.9519	.7363	4.6883	1751.07	411.0	2162.0
198.00	362.97	.001740	.00274	.00448	1796.41	931.5	2243.9	3.9704	.7031	4.6735	1761.95	393.3	2155.2
200.00	363.75	.001773	.00256	.00433	1808.58	932.2	2234.6	3.9695	.6689	4.6584	1773.12	375.0	2148.1
202.00	364.51	.001812	.00238	.00419	1821.21	934.2	2225.4	4.0093	.6336	4.6429	1784.61	356.0	2140.7
204.00	365.26	.001857	.00220	.00406	1834.41	936.1	2215.5	4.0300	.5967	4.6267	1796.53	336.2	2132.7
206.00	366.00	.001908	.00202	.00393	1848.21	937.9	2205.2	4.0516	.5564	4.6099	1808.89	315.4	2124.3
208.00	366.72	.001967	.00185	.00380	1862.77	939.6	2194.4	4.0743	.5120	4.5924	1821.65	293.5	2115.4
210.00	367.42	.002035	.00164	.00368	1878.31	941.5	2182.8	4.0986	.4752	4.5757	1835.57	270.0	2105.6
212.00	368.11	.002115	.00145	.00356	1895.02	943.3	2170.4	4.1246	.4292	4.5588	1850.22	244.6	2094.8
214.00	368.79	.002202	.00124	.00345	1913.20	943.5	2156.7	4.1531	.3791	4.5321	1866.16	216.8	2083.0
216.00	369.44	.002307	.00103	.00334	1933.72	947.8	2141.5	4.1846	.3232	4.5060	1883.89	185.5	2069.4
218.00	370.08	.002441	.00079	.00323	1958.60	954.3	2122.9	4.2235	.2553	4.4788	1905.37	147.0	2052.4
220.00	370.69	.002668	.00043	.00310	2000.57	92.3	2092.9	4.2657	.1433	4.4290	1941.85	82.8	2024.7

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°C	Pres. Bar	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg·K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u _s	Δu	u ¹ _s
3.82	.00673	.000905	168.53	168.58	.00	2320.2	2320.2	.0000	8.3682	8.3682	.00	2205.7	2206.7
4	.00682	.000905	166.47	166.47	.77	2319.7	2320.5	.0025	8.3612	8.3640	.77	2205.2	2207.0
5	.00733	.000905	155.37	155.37	5.03	2317.2	2322.2	.0181	8.3381	8.3402	5.03	2203.3	2208.4
6	.00787	.000905	145.13	145.13	9.28	2314.7	2324.0	.0333	8.2854	8.3167	9.28	2200.5	2209.7
7	.00845	.000905	135.63	135.63	13.51	2312.2	2325.7	.0484	8.2449	8.2754	13.52	2197.6	2211.1
8	.00907	.000905	126.81	126.81	17.77	2309.7	2327.5	.0635	8.2067	8.2373	17.77	2194.7	2212.5
9	.00973	.000905	118.63	118.63	22.01	2307.2	2329.2	.0786	8.1687	8.2473	22.01	2191.8	2213.8
10	.01042	.000905	111.03	111.03	26.25	2304.7	2330.9	.0935	8.1311	8.2246	26.25	2188.9	2215.2
11	.01117	.000905	103.99	103.99	30.48	2302.2	2332.6	.1085	8.0937	8.2021	30.49	2186.1	2216.5
12	.01196	.000905	97.446	97.447	34.73	2299.6	2334.4	.1233	8.0565	8.1798	34.72	2183.2	2217.9
13	.01279	.000905	91.356	91.357	38.96	2297.1	2336.1	.1381	8.0186	8.1577	38.96	2180.3	2219.2
14	.01368	.000905	85.685	85.686	43.19	2294.6	2337.8	.1528	7.9809	8.1353	43.19	2177.4	2220.6
15	.01463	.000905	80.405	80.405	47.42	2292.1	2339.5	.1675	7.9436	8.1141	47.42	2174.5	2221.9
16	.01563	.000905	75.504	75.505	51.65	2289.6	2341.3	.1821	7.9065	8.0926	51.65	2171.6	2223.3
17	.01669	.000905	70.933	70.934	55.88	2287.1	2343.0	.1967	7.8745	8.0713	55.88	2168.7	2224.6
18	.01782	.000905	66.570	66.571	60.10	2284.6	2344.7	.2112	7.8370	8.0502	60.10	2165.8	2225.9
19	.01901	.000905	62.690	62.691	64.33	2282.1	2346.4	.2257	7.8036	8.0292	64.32	2162.9	2227.3
20	.02027	.000905	58.973	58.974	68.55	2279.5	2348.1	.2401	7.7684	8.0084	68.55	2160.0	2228.6
21	.02160	.000905	55.516	55.517	72.77	2277.0	2349.8	.2544	7.7335	7.9879	72.77	2157.1	2229.9
22	.02301	.000905	52.284	52.285	76.99	2274.5	2351.5	.2687	7.6986	7.9675	76.99	2154.2	2231.2
23	.02450	.000905	49.260	49.261	81.21	2272.0	2353.2	.2829	7.6635	7.9472	81.20	2151.3	2232.5
24	.02603	.000905	46.431	46.432	85.42	2269.5	2354.9	.2971	7.6300	7.9272	85.42	2148.4	2233.8
25	.02774	.000906	43.783	43.784	89.63	2267.0	2356.6	.3113	7.5963	7.9073	89.63	2145.5	2235.1
26	.02950	.000906	41.314	41.315	93.85	2264.4	2358.3	.3253	7.5627	7.8876	93.85	2142.6	2236.4
27	.03135	.000906	38.999	38.999	98.06	2261.9	2360.0	.3394	7.5287	7.8681	98.06	2139.7	2237.7
28	.03331	.000906	36.829	36.830	102.27	2259.4	2361.7	.3533	7.4953	7.8487	102.27	2136.7	2239.0
29	.03536	.000907	34.794	34.795	106.48	2256.9	2363.3	.3673	7.4622	7.8295	106.48	2133.8	2240.3
30	.03753	.000907	32.884	32.885	110.69	2254.3	2365.0	.3812	7.4292	7.8104	110.69	2130.9	2241.6
31	.03982	.000907	31.099	31.099	114.90	2251.8	2366.7	.3950	7.3966	7.7915	114.90	2128.0	2242.9
32	.04223	.000907	29.422	29.423	119.11	2249.3	2368.4	.4088	7.3641	7.7728	119.10	2125.1	2244.2
33	.04476	.000907	27.846	27.847	123.31	2246.7	2370.0	.4225	7.3318	7.7543	123.31	2122.1	2245.4
34	.04742	.000908	26.365	26.366	127.51	2244.2	2371.7	.4362	7.2996	7.7358	127.51	2119.2	2246.7
35	.05022	.000908	24.972	24.973	131.72	2241.7	2373.4	.4498	7.2678	7.7176	131.71	2116.3	2248.0
36	.05316	.000908	23.667	23.668	135.92	2239.1	2375.0	.4634	7.2361	7.6995	135.92	2113.3	2249.2
37	.05626	.000908	22.433	22.439	140.12	2236.6	2376.7	.4770	7.2046	7.6816	140.12	2110.4	2250.5
38	.05950	.000909	21.281	21.282	144.32	2234.0	2378.4	.4905	7.1733	7.6638	144.32	2107.4	2251.7
39	.06291	.000909	20.192	20.192	148.52	2231.5	2380.0	.5039	7.1422	7.6461	148.52	2104.5	2253.0
40	.06648	.000909	19.164	19.165	152.72	2229.0	2381.7	.5173	7.1113	7.6286	152.71	2101.6	2254.3
41	.07024	.000909	18.200	18.201	156.92	2226.4	2383.3	.5307	7.0806	7.6112	156.91	2098.6	2255.5
42	.07417	.000910	17.289	17.290	161.11	2223.9	2385.0	.5440	7.0500	7.5940	161.11	2095.6	2256.7
43	.07829	.000910	16.431	16.432	165.31	2221.3	2386.6	.5573	7.0197	7.5770	165.30	2092.7	2258.0
44	.08261	.000910	15.621	15.621	169.50	2218.8	2388.3	.5705	6.9896	7.5600	169.50	2089.7	2259.2
45	.08712	.000911	14.854	14.855	173.70	2216.2	2389.9	.5837	6.9596	7.5432	173.69	2086.8	2260.5
46	.09186	.000911	14.135	14.136	177.89	2213.6	2391.5	.5968	6.9298	7.5266	177.88	2083.8	2261.7
47	.09682	.000911	13.454	13.455	182.08	2211.1	2393.2	.6099	6.9002	7.5101	182.08	2080.9	2262.9
48	.10200	.000911	12.810	12.811	186.28	2208.5	2394.8	.6229	6.8707	7.4937	186.27	2077.9	2264.1
49	.10741	.000912	12.202	12.202	190.47	2206.0	2396.4	.6359	6.8415	7.4774	190.46	2074.9	2265.4

°C	Pres. Bar	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg·K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u _s	Δu	u ¹ _s
50	.11307	.000912	11.625	11.625	124.14	2203.4	2338.1	.6489	6.6124	7.4613	194.65	2072.0	2266.6
51	.11659	.000913	11.622	11.623	124.17	2203.8	2339.7	.6512	6.6137	7.4653	196.84	2069.0	2267.8
52	.12016	.000915	10.657	10.658	124.20	2204.3	2341.5	.6537	6.6150	7.4694	203.02	2066.0	2269.0
53	.12376	.000917	10.000	10.001	124.23	2204.7	2343.3	.6562	6.6163	7.4737	207.21	2063.0	2270.2
54	.12739	.000919	9.6281	9.6290	124.26	2205.1	2345.1	.6587	6.6176	7.4781	211.40	2060.0	2271.4
55	.13103	.000921	9.1802	9.1811	124.29	2205.5	2346.9	.6612	6.6189	7.4825	215.58	2057.1	2272.6
56	.13470	.000923	8.7666	8.7675	124.32	2205.9	2348.7	.6637	6.6202	7.4870	219.77	2054.1	2273.8
57	.13839	.000925	8.3743	8.3753	124.35	2206.3	2350.5	.6662	6.6215	7.4915	223.95	2051.1	2275.0
58	.14209	.000927	8.0014	8.0023	124.38	2206.7	2352.3	.6687	6.6228	7.4960	228.14	2048.1	2276.2
59	.14580	.000929	7.6480	7.6489	124.41	2207.1	2354.1	.6712	6.6241	7.5005	232.32	2045.1	2277.4
60	.14953	.000931	7.3125	7.3134	124.44	2207.5	2355.9	.6737	6.6254	7.5050	236.50	2042.1	2278.6
61	.15327	.000933	6.9945	6.9954	124.47	2207.9	2357.7	.6762	6.6267	7.5095	240.68	2039.1	2279.8
62	.15702	.000935	6.6934	6.6943	124.50	2208.3	2359.5	.6787	6.6280	7.5140	244.86	2036.1	2281.0
63	.16078	.000937	6.4051	6.4060	124.53	2208.7	2361.3	.6812	6.6293	7.5185	249.04	2033.1	2282.2
64	.16455	.000939	6.1321	6.1331	124.56	2209.1	2363.1	.6837	6.6306	7.5230	253.22	2030.1	2283.4
65	.16833	.000941	5.8725	5.8734	124.59	2209.5	2364.9	.6862	6.6319	7.5275	257.40	2027.1	2284.6
66	.17212	.000943	5.6260	5.6269	124.62	2209.9	2366.7	.6887	6.6332	7.5320	261.58	2024.1	2285.8
67	.17592	.000945	5.3915	5.3925	124.65	2210.3	2368.5	.6912	6.6345	7.5365	265.76	2021.1	2286.9
68	.17973	.000947	5.1680	5.1690	124.68	2210.7	2370.3	.6937	6.6358	7.5410	269.93	2018.1	2288.1
69	.18355	.000949	4.9556	4.9565	124.71	2211.1	2372.1	.6962	6.6371	7.5455	274.11	2015.1	2289.2
70	.18738	.000951	4.7549	4.7558	124.74	2211.5	2373.9	.6987	6.6384	7.5500	278.28	2012.1	2290.4
71	.19122	.000953	4.5662	4.5671	124.77	2211.9	2375.7	.7012	6.6397	7.5545	282.46	2009.1	2291.5
72	.19507	.000955	4.3886	4.3895	124.80	2212.3	2377.5	.7037	6.6410	7.5590	286.63	2006.1	2292.7
73	.19893	.000957	4.2215	4.2224	124.83	2212.7	2379.3	.7062	6.6423	7.5635	290.80	2003.1	2293.8
74	.20280	.000959	4.0647	4.0656	124.86	2213.1	2381.1	.7087	6.6436	7.5680	294.98	2000.0	2295.0
75	.20668	.000961	3.9175	3.9184	124.89	2213.5	2382.9	.7112	6.6449	7.5725	299.15	1997.0	2296.1
76	.21057	.000963	3.7793	3.7802	124.92	2213.9	2384.7	.7137	6.6462	7.5770	303.32	1993.9	2297.3
77	.21447	.000965	3.6497	3.6506	124.95	2214.3	2386.5	.7162	6.6475	7.5815	307.49	1990.9	2298.4
78	.21838	.000967	3.5283	3.5292	124.98	2214.7	2388.3	.7187	6.6488	7.5860	311.66	1987.9	2299.6
79	.22230	.000969	3.4145	3.4154	125.01	2215.1	2390.1	.7212	6.6501	7.5905	315.83	1984.9	2300.7
80	.22623	.000971	3.3078	3.3087	125.04	2215.5	2391.9	.7237	6.6514	7.5950	320.00	1981.9	2301.8
81	.23017	.000973	3.2074	3.2083	125.07	2215.9	2393.7	.7262	6.6527	7.6000	324.16	1978.8	2303.0
82	.23412	.000975	3.1124	3.1133	125.10	2216.3	2395.5	.7287	6.6540	7.6050	328.32	1975.8	2304.1
83	.23808	.000977	3.0228	3.0237	125.13	2216.7	2397.3	.7312	6.6553	7.6100	332.50	1972.7	2305.2
84	.24205	.000979	2.9384	2.9393	125.16	2217.1	2399.1	.7337	6.6566	7.6150	336.66	1969.7	2306.3
85	.24603	.000981	2.8592	2.8601	125.19	2217.5	2400.9	.7362	6.6579	7.6200	340.83	1966.6	2307.5
86	.25002	.000983	2.7850	2.7859	125.22	2217.9	2402.7	.7387	6.6592	7.6250	344.99	1963.6	2308.6
87	.25402	.000985	2.7157	2.7166	125.25	2218.3	2404.5	.7412	6.6605	7.6300	349.16	1960.5	2309.7
88	.25803	.000987	2.6514	2.6523	125.28	2218.7	2406.3	.7437	6.6618	7.6350	353.32	1957.5	2310.8
89	.26205	.000989	2.5919	2.5928	125.31	2219.1	2408.1	.7462	6.6631	7.6400	357.48	1954.5	2311.9
90	.26608	.000991	2.5372	2.5381	125.34	2219.5	2409.9	.7487	6.6644	7.6450	361.64	1951.4	2313.0
91	.27012	.000993	2.4872	2.4881	125.37	2219.9	2411.7	.7512	6.6657	7.6500	365.80	1948.4	2314.2
92	.27417	.000995	2.4417	2.4426	125.40	2220.3	2413.5	.7537	6.6670	7.6550	369.97	1945.3	2315.3
93	.27823	.000997	2.3997	2.4006	125.43	2220.7	2415.3	.7562	6.6683	7.6600	374.13	1942.2	2316.4
94	.28230	.000999	2.3610	2.3619	125.46	2221.1	2417.1	.7587	6.6696	7.6650	378.28	1939.2	2317.5
95	.28638	.001001	2.3255	2.3264	125.49	2221.5	2418.9	.7612	6.6709	7.6700	382.44	1936.1	2318.6
96	.29047	.001003	2.2930	2.2939	125.52	2221.9	2420.7	.7637	6.6722	7.6750	386.60	1933.0	2319.6
97	.29457	.001005	2.2634	2.2643	125.55	2222.3	2422.5	.7662	6.6735	7.6800	390.75	1930.0	2320.7
98	.29868	.001007	2.2366	2.2375	125.58	2222.7	2424.3	.7687	6.6748	7.6850	394.92	1926.9	2321.8
99	.30280	.001009	2.2124	2.2133	125.61	2223.1	2426.1	.7712	6.6761	7.6900	399.07	1923.9	2322.9

°C	Pres. Bar	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg°K			Energ. Interna kJ/kg		
		V _s	ΔV	V _s ¹	i _s	L	i _s ¹	S _s	L/T	S _s ¹	u _s	Δu	u _s ¹
100	1.98129	.000942	1.5407	1.5417	403.72	2072.0	2475.3	1.2484	5.3483	6.7567	403.23	1920.6	2324.0
101	1.0176	.000942	1.4035	1.4005	407.48	2069.3	2476.8	1.2495	5.3563	6.7503	407.39	1917.7	2325.1
102	1.0549	.000943	1.4403	1.4412	411.34	2066.6	2478.2	1.2506	5.3644	6.7450	411.51	1914.6	2326.2
103	1.0934	.000944	1.3930	1.3939	415.20	2063.9	2479.7	1.2518	5.3726	6.7392	415.70	1911.6	2327.3
104	1.1330	.000945	1.3474	1.3484	419.06	2061.2	2481.1	1.2529	5.3809	6.7335	419.85	1908.5	2328.3
105	1.1735	.000946	1.3037	1.3046	422.92	2058.4	2482.5	1.2539	5.3893	6.7279	424.00	1905.4	2329.4
106	1.2158	.000946	1.2616	1.2625	426.79	2055.7	2484.0	1.2549	5.3978	6.7224	428.16	1902.3	2330.5
107	1.2590	.000947	1.2212	1.2222	430.65	2053.0	2485.4	1.2559	5.4063	6.7169	432.31	1899.2	2331.5
108	1.3035	.000948	1.1823	1.1832	434.51	2050.3	2486.8	1.2569	5.4149	6.7115	436.46	1896.2	2332.6
109	1.3492	.000949	1.1445	1.1457	438.37	2047.5	2488.3	1.2579	5.4235	6.7062	440.62	1893.1	2333.7
110	1.3963	.000950	1.1087	1.1097	442.23	2044.6	2489.7	1.2589	5.4322	6.7009	444.77	1890.0	2334.7
111	1.4447	.000951	1.0741	1.0750	446.08	2041.8	2491.1	1.2599	5.4409	6.6956	448.92	1886.9	2335.8
112	1.4945	.000951	1.0406	1.0415	449.93	2039.0	2492.5	1.2609	5.4497	6.6903	453.07	1883.8	2336.9
113	1.5457	.000952	1.0084	1.0094	453.77	2036.2	2493.9	1.2619	5.4585	6.6850	457.22	1880.7	2337.9
114	1.5982	.000953	.97740	.97835	457.61	2033.4	2495.3	1.2629	5.4674	6.6797	461.37	1877.6	2339.0
115	1.6522	.000954	.94749	.94844	461.45	2030.6	2496.7	1.2639	5.4763	6.6744	465.52	1874.5	2340.0
116	1.7076	.000955	.91872	.91966	465.29	2027.8	2498.1	1.2649	5.4853	6.6691	469.67	1871.4	2341.1
117	1.7648	.000956	.89104	.89198	469.13	2025.0	2499.5	1.2659	5.4943	6.6638	473.82	1868.3	2342.1
118	1.8234	.000957	.86420	.86516	472.97	2022.2	2500.9	1.2669	5.5034	6.6585	477.96	1865.2	2343.2
119	1.8835	.000957	.83839	.83935	476.81	2019.4	2502.3	1.2679	5.5125	6.6532	482.11	1862.1	2344.2
120	1.9453	.000958	.81349	.81445	480.65	2016.6	2503.7	1.2689	5.5216	6.6479	486.26	1859.0	2345.3
121	2.0087	.000959	.78946	.79042	484.49	2013.8	2505.1	1.2699	5.5307	6.6426	490.41	1855.9	2346.3
122	2.0736	.000960	.76626	.76722	488.33	2011.0	2506.5	1.2709	5.5398	6.6373	494.56	1852.8	2347.3
123	2.1406	.000961	.74389	.74485	492.17	2008.2	2507.9	1.2719	5.5489	6.6320	498.71	1849.7	2348.4
124	2.2091	.000962	.72225	.72321	496.01	2005.4	2509.2	1.2729	5.5580	6.6267	502.86	1846.5	2349.4
125	2.2793	.000963	.70132	.70228	500.05	2002.6	2510.5	1.2739	5.5671	6.6214	507.01	1843.4	2350.5
126	2.3514	.000964	.68133	.68229	504.09	2000.0	2511.9	1.2749	5.5762	6.6161	511.16	1840.3	2351.5
127	2.4254	.000965	.66215	.66311	508.13	1997.2	2513.2	1.2759	5.5853	6.6108	515.31	1837.2	2352.5
128	2.5012	.000965	.64369	.64465	512.17	1994.4	2514.6	1.2769	5.5944	6.6055	519.46	1834.1	2353.5
129	2.5769	.000966	.62457	.62553	516.21	1991.6	2515.9	1.2779	5.6035	6.6002	523.61	1831.0	2354.5
130	2.6585	.000967	.60732	.60828	520.25	1988.8	2517.3	1.2789	5.6126	6.5949	527.76	1827.8	2355.6
131	2.7401	.000968	.59036	.59133	524.29	1986.0	2518.6	1.2799	5.6217	6.5896	531.91	1824.7	2356.6
132	2.8238	.000969	.57393	.57490	528.33	1983.2	2519.9	1.2809	5.6308	6.5843	536.06	1821.5	2357.6
133	2.9095	.000970	.55813	.55910	532.37	1980.4	2521.3	1.2819	5.6399	6.5790	540.21	1818.4	2358.6
134	2.9973	.000971	.54273	.54375	536.41	1977.6	2522.6	1.2829	5.6490	6.5737	544.36	1815.2	2359.6
135	3.0871	.000972	.52790	.52888	540.45	1974.8	2523.9	1.2839	5.6581	6.5684	548.51	1812.1	2360.6
136	3.1793	.000973	.51357	.51454	544.49	1972.0	2525.2	1.2849	5.6672	6.5631	552.66	1808.9	2361.5
137	3.2736	.000974	.49966	.50064	548.53	1969.2	2526.5	1.2859	5.6763	6.5578	556.81	1805.8	2362.5
138	3.3701	.000975	.48623	.48721	552.57	1966.4	2527.8	1.2869	5.6854	6.5525	560.96	1802.6	2363.5
139	3.4689	.000976	.47321	.47419	556.61	1963.6	2529.1	1.2879	5.6945	6.5472	565.11	1799.4	2364.5
140	3.5700	.000977	.46052	.46150	560.65	1960.8	2530.4	1.2889	5.7036	6.5419	569.26	1796.2	2365.5
141	3.6735	.000978	.44833	.44931	564.69	1958.0	2531.7	1.2899	5.7127	6.5366	573.41	1793.1	2366.5
142	3.7795	.000978	.43660	.43758	568.73	1955.2	2533.0	1.2909	5.7218	6.5313	577.56	1790.0	2367.5
143	3.8878	.000979	.42513	.42611	572.77	1952.4	2534.2	1.2919	5.7309	6.5260	581.71	1786.8	2368.5
144	3.9986	.000980	.41401	.41499	576.81	1949.6	2535.5	1.2929	5.7400	6.5207	585.86	1783.6	2369.5
145	4.1119	.000981	.40327	.40425	580.85	1946.8	2536.8	1.2939	5.7491	6.5154	590.01	1780.4	2370.5
146	4.2278	.000982	.39286	.39385	584.89	1944.0	2538.0	1.2949	5.7582	6.5101	594.16	1777.2	2371.5
147	4.3464	.000983	.38278	.38376	588.93	1941.2	2539.3	1.2959	5.7673	6.5048	598.31	1774.1	2372.5
148	4.4676	.000984	.37299	.37398	592.97	1938.4	2540.5	1.2969	5.7764	6.4995	602.46	1770.9	2373.5
149	4.5924	.000985	.36353	.36451	597.01	1935.6	2541.8	1.2979	5.7855	6.4942	606.61	1767.7	2374.5

°C	Pres. bars	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg·°K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u _s	Δu	u ¹ _s
150	4.7179	.000966	.35432	.35531	611.39	1931.6	2543.0	1.7709	4.5618	6.3326	610.93	1701.5	2375.4
151	4.8474	.000967	.34935	.34634	615.58	1928.7	2544.3	1.7607	4.5441	6.3248	615.10	1761.3	2376.4
152	4.9796	.000968	.33674	.33773	619.76	1925.7	2545.5	1.7516	4.5264	6.3170	619.27	1758.0	2377.3
153	5.1147	.000969	.32330	.32929	623.94	1922.8	2546.7	1.8004	4.5039	6.3092	623.44	1754.9	2378.3
154	5.2526	.000990	.32021	.32120	628.13	1919.8	2547.9	1.8102	4.4914	6.3016	627.61	1751.6	2379.2
155	5.3935	.000991	.31226	.31325	632.32	1916.8	2549.1	1.8200	4.4740	6.2939	631.78	1748.4	2380.2
156	5.5375	.000992	.30455	.30554	636.51	1913.8	2550.3	1.8297	4.4566	6.2863	635.96	1745.2	2381.1
157	5.6846	.000993	.29714	.29814	640.70	1910.8	2551.5	1.8395	4.4393	6.2786	640.13	1741.9	2382.1
158	5.8347	.000994	.28989	.29088	644.89	1907.8	2552.7	1.8492	4.4221	6.2713	644.31	1738.7	2383.0
159	5.9879	.000995	.28289	.28388	649.09	1904.8	2553.9	1.8589	4.4049	6.2638	648.49	1735.5	2383.9
160	6.1443	.000996	.27603	.27702	653.29	1901.8	2555.1	1.8686	4.3878	6.2564	652.68	1732.2	2384.9
161	6.3040	.000997	.26942	.27042	657.49	1898.8	2556.3	1.8783	4.3707	6.2490	656.86	1729.0	2385.8
162	6.4670	.000998	.26298	.26398	661.69	1895.8	2557.5	1.8879	4.3537	6.2417	661.05	1725.7	2386.8
163	6.6333	.001000	.25671	.25771	665.90	1892.7	2558.6	1.8976	4.3368	6.2344	665.24	1722.5	2387.7
164	6.8030	.001001	.25066	.25166	670.11	1889.7	2559.8	1.9072	4.3199	6.2271	669.43	1719.2	2388.6
165	6.9760	.001002	.24471	.24572	674.32	1886.6	2561.0	1.9168	4.3031	6.2199	673.62	1715.9	2389.6
166	7.1527	.001003	.23899	.23999	678.54	1883.6	2562.1	1.9264	4.2863	6.2128	677.82	1712.6	2390.5
167	7.3329	.001004	.23344	.23444	682.75	1880.5	2563.3	1.9360	4.2696	6.2056	682.02	1709.3	2391.4
168	7.5166	.001005	.22796	.22896	686.97	1877.4	2564.4	1.9456	4.2529	6.1985	686.22	1706.1	2392.3
169	7.7040	.001006	.22269	.22369	691.20	1874.3	2565.5	1.9551	4.2364	6.1915	690.42	1702.8	2393.2
170	7.8949	.001007	.21761	.21861	695.42	1871.2	2566.7	1.9647	4.2198	6.1845	694.63	1699.4	2394.1
171	8.0898	.001008	.21257	.21358	699.65	1868.1	2567.8	1.9742	4.2033	6.1775	698.84	1696.2	2395.0
172	8.2885	.001009	.20774	.20875	703.88	1865.0	2568.9	1.9837	4.1869	6.1705	703.05	1692.8	2395.9
173	8.4909	.001010	.20300	.20401	708.12	1861.9	2570.0	1.9932	4.1705	6.1637	707.26	1689.5	2396.8
174	8.6971	.001012	.19841	.19942	712.36	1858.7	2571.1	2.0027	4.1542	6.1565	711.48	1686.2	2397.7
175	8.9073	.001013	.19392	.19494	716.60	1855.6	2572.2	2.0121	4.1379	6.1490	715.70	1682.9	2398.6
176	9.1217	.001014	.18957	.19058	720.85	1852.4	2573.3	2.0216	4.1217	6.1432	719.92	1679.5	2399.4
177	9.3401	.001015	.18533	.18635	725.10	1849.3	2574.4	2.0310	4.1055	6.1365	724.15	1676.2	2400.3
178	9.5625	.001016	.18123	.18224	729.35	1846.1	2575.4	2.0404	4.0894	6.1298	728.38	1672.8	2401.2
179	9.7891	.001017	.17718	.17819	733.61	1842.9	2576.5	2.0499	4.0733	6.1231	732.62	1669.5	2402.1
180	10.020	.001018	.17329	.17431	737.87	1839.7	2577.6	2.0593	4.0572	6.1165	736.85	1666.1	2402.9
181	10.255	.001020	.16945	.17047	742.14	1836.5	2578.6	2.0687	4.0412	6.1099	741.07	1662.7	2403.8
182	10.494	.001021	.16577	.16679	746.41	1833.3	2579.7	2.0780	4.0253	6.1033	745.34	1659.3	2404.6
183	10.738	.001022	.16217	.16320	750.68	1830.0	2580.7	2.0874	4.0094	6.0968	749.59	1655.9	2405.5
184	10.985	.001023	.15865	.15967	754.96	1826.8	2581.8	2.0968	3.9935	6.0903	753.84	1652.5	2406.3
185	11.239	.001024	.15523	.15625	759.25	1823.5	2582.9	2.1061	3.9777	6.0838	758.10	1649.1	2407.2
186	11.496	.001026	.15189	.15291	763.54	1820.3	2583.8	2.1154	3.9619	6.0774	762.36	1645.7	2408.0
187	11.758	.001027	.14862	.14964	767.83	1817.0	2584.8	2.1248	3.9462	6.0710	766.62	1642.2	2408.9
188	12.025	.001028	.14545	.14648	772.13	1813.7	2585.8	2.1341	3.9305	6.0646	770.89	1638.8	2409.7
189	12.295	.001029	.14235	.14338	776.43	1810.4	2586.8	2.1434	3.9149	6.0583	775.16	1635.4	2410.5
190	12.572	.001030	.13935	.14039	780.74	1807.1	2587.8	2.1527	3.8993	6.0520	779.44	1631.9	2411.3
191	12.853	.001032	.13642	.13745	785.05	1803.8	2588.8	2.1620	3.8837	6.0457	783.72	1628.4	2412.1
192	13.139	.001033	.13353	.13456	789.37	1800.4	2589.8	2.1713	3.8682	6.0395	788.01	1625.0	2413.0
193	13.430	.001034	.13075	.13178	793.69	1797.1	2590.7	2.1805	3.8527	6.0333	792.30	1621.5	2413.8
194	13.726	.001036	.12805	.12909	798.02	1793.7	2591.7	2.1898	3.8373	6.0271	796.59	1617.9	2414.5
195	14.026	.001037	.12538	.12642	802.35	1790.3	2592.7	2.1991	3.8219	6.0207	800.90	1614.4	2415.3
196	14.333	.001038	.12278	.12381	806.69	1786.9	2593.6	2.2083	3.8065	6.0148	805.20	1610.9	2416.1
197	14.644	.001039	.12026	.12130	811.03	1783.5	2594.5	2.2176	3.7912	6.0087	809.51	1607.4	2416.9
198	14.960	.001041	.11776	.11880	815.39	1780.1	2595.5	2.2268	3.7759	6.0026	813.83	1603.9	2417.8
199	15.282	.001042	.11537	.11641	819.74	1776.7	2596.4	2.2360	3.7606	5.9966	818.15	1600.3	2418.5

°C	Pres. Bar	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg°K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u _s	Δu	u ¹ _s
200	15.609	.001044	.11301	.11405	824.10	1773.2	2597.3	2.2452	3.7454	5.0406	822.48	1396.8	2419.3
201	15.942	.001045	.11072	.11176	820.17	1769.7	2598.2	2.2544	3.7302	5.0546	826.81	1593.2	2420.0
202	16.260	.001046	.10849	.10954	812.85	1766.3	2599.1	2.2637	3.7150	5.0757	831.15	1590.7	2420.8
203	16.624	.001046	.10632	.10737	807.23	1762.8	2600.0	2.2729	3.6997	5.0920	835.89	1586.0	2421.5
204	16.973	.001049	.10415	.10521	801.82	1759.3	2600.9	2.2820	3.6846	5.0669	839.64	1582.5	2422.3
205	17.328	.001050	.10211	.10316	846.81	1755.7	2601.7	2.2912	3.6697	5.0610	844.19	1578.8	2423.0
206	17.669	.001052	.10003	.10105	850.41	1752.2	2602.5	2.3004	3.6546	5.0550	848.55	1575.2	2423.8
207	18.055	.001053	.09808	.09911	854.82	1748.5	2603.3	2.3096	3.6394	5.0480	852.92	1571.5	2424.4
208	18.428	.001055	.09613	.09719	859.24	1744.6	2604.1	2.3188	3.6242	5.0430	857.29	1567.7	2425.0
209	18.606	.001056	.09423	.09529	863.65	1741.1	2604.7	2.3279	3.6089	5.0368	861.67	1563.9	2425.5
210	19.190	.001058	.09235	.09340	868.09	1737.3	2605.4	2.3371	3.5936	5.0307	866.06	1560.1	2426.1
211	19.501	.001059	.09055	.09161	872.52	1733.4	2606.0	2.3463	3.5782	5.0245	870.45	1556.1	2426.6
212	19.977	.001061	.08874	.08980	876.97	1729.5	2606.5	2.3554	3.5628	5.0182	874.85	1552.3	2427.1
213	20.380	.001062	.08703	.08809	881.42	1725.6	2607.0	2.3646	3.5474	5.0120	879.25	1548.2	2427.5
214	20.789	.001064	.08533	.08640	885.88	1721.6	2607.5	2.3737	3.5320	5.0056	883.66	1544.2	2427.8
215	21.204	.001065	.08363	.08470	890.34	1717.5	2607.9	2.3829	3.5164	5.0000	888.08	1540.2	2428.3
216	21.626	.001067	.08203	.08310	894.81	1713.5	2608.3	2.3920	3.5009	5.0029	892.51	1536.1	2428.6
217	22.055	.001068	.08046	.08153	899.30	1709.3	2608.6	2.4012	3.4853	5.0065	896.94	1531.9	2428.8
218	22.489	.001070	.07888	.07995	903.79	1705.2	2608.9	2.4103	3.4697	5.0000	901.38	1527.8	2429.1
219	22.930	.001072	.07736	.07845	908.28	1700.9	2609.2	2.4194	3.4541	5.0036	905.83	1523.5	2429.3
220	23.378	.001073	.07588	.07695	912.79	1696.7	2609.5	2.4286	3.4385	5.0070	910.28	1519.3	2429.6
221	23.833	.001075	.07443	.07551	917.31	1692.4	2609.7	2.4377	3.4228	5.0000	914.75	1515.0	2429.7
222	24.295	.001077	.07299	.07407	921.82	1688.2	2609.9	2.4468	3.4072	5.0040	919.21	1510.7	2429.9
223	24.763	.001078	.07159	.07267	926.35	1683.7	2610.0	2.4559	3.3915	5.0075	923.68	1506.4	2430.1
224	25.236	.001080	.07025	.07133	930.89	1679.3	2610.2	2.4651	3.3758	5.0000	928.17	1502.0	2430.1
225	25.720	.001082	.06890	.06998	935.44	1674.8	2610.3	2.4742	3.3601	5.0034	932.66	1497.6	2430.3
226	26.210	.001083	.06760	.06869	940.00	1670.3	2610.3	2.4834	3.3444	5.0070	937.16	1493.2	2430.3
227	26.705	.001085	.06633	.06742	944.55	1665.8	2610.4	2.4925	3.3287	5.0000	941.67	1488.7	2430.4
228	27.210	.001087	.06505	.06614	949.14	1661.3	2610.4	2.5016	3.3131	5.0047	946.18	1484.3	2430.5
229	27.720	.001089	.06384	.06492	953.72	1656.7	2610.4	2.5107	3.2973	5.0081	950.70	1479.7	2430.5
230	28.233	.001091	.06262	.06371	958.32	1652.1	2610.4	2.5199	3.2816	5.0015	955.24	1475.3	2430.5
231	28.764	.001092	.06147	.06257	962.92	1647.5	2610.4	2.5290	3.2659	5.0049	959.78	1470.6	2430.4
232	29.297	.001094	.06032	.06141	967.53	1642.8	2610.3	2.5381	3.2502	5.0083	964.32	1466.1	2430.4
233	29.837	.001096	.05922	.06032	972.15	1638.4	2610.5	2.5472	3.2345	5.0000	968.88	1461.7	2430.5
234	30.385	.001098	.05811	.05921	976.78	1633.8	2610.6	2.5564	3.2187	5.0034	973.44	1457.2	2430.7
235	30.941	.001100	.05707	.05817	981.42	1629.2	2610.6	2.5655	3.2030	5.0068	978.02	1452.6	2430.6
236	31.504	.001102	.05598	.05709	986.07	1624.6	2610.6	2.5746	3.1873	5.0000	982.60	1448.2	2430.8
237	32.076	.001104	.05497	.05608	990.73	1619.9	2610.7	2.5838	3.1716	5.0034	987.19	1443.6	2430.8
238	32.655	.001106	.05394	.05505	995.40	1615.2	2610.6	2.5929	3.1559	5.0068	991.79	1439.0	2430.8
239	33.242	.001108	.05300	.05411	1000.08	1610.4	2610.4	2.6020	3.1402	5.0000	996.40	1434.2	2430.6
240	33.837	.001110	.05193	.05309	1004.77	1605.5	2610.3	2.6112	3.1245	5.0034	1001.02	1429.5	2430.5
241	34.440	.001112	.05085	.05216	1009.47	1600.8	2610.3	2.6203	3.1088	5.0068	1005.64	1425.0	2430.7
242	35.052	.001114	.05015	.05126	1014.19	1596.1	2610.3	2.6295	3.0931	5.0000	1010.28	1420.4	2430.6
243	35.671	.001116	.04923	.05034	1018.91	1591.4	2610.3	2.6386	3.0774	5.0034	1014.93	1415.6	2430.8
244	36.299	.001118	.04834	.04946	1023.64	1586.7	2610.4	2.6478	3.0617	5.0068	1019.58	1411.2	2430.8
245	36.935	.001120	.04748	.04860	1028.38	1582.0	2610.4	2.6569	3.0460	5.0000	1024.24	1406.6	2430.9
246	37.579	.001122	.04665	.04777	1033.14	1577.2	2610.3	2.6661	3.0303	5.0034	1028.92	1401.9	2430.8
247	38.232	.001124	.04581	.04693	1037.90	1572.4	2610.3	2.6752	3.0146	5.0068	1033.60	1397.3	2430.9
248	38.894	.001127	.04497	.04610	1042.68	1567.6	2610.3	2.6844	3.0000	5.0000	1038.29	1392.7	2431.0
249	39.564	.001129	.04416	.04529	1047.46	1562.8	2610.2	2.6935	2.9843	5.0034	1043.00	1388.1	2431.0

°C	Pres. bars	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg·°K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u _s	Δu	u ¹ _s
250	40.243	.001131	.04342	.04156	1052.26	1557.9	2610.2	2.7027	2.9763	5.6791	1047.71	1163.2	2430.9
251	40.931	.001133	.04265	.04378	1057.07	1555.0	2610.1	2.7112	2.9813	5.6752	1052.43	1173.5	2430.9
252	41.627	.001136	.04186	.04300	1061.85	1548.1	2610.0	2.7201	2.9863	5.6714	1057.16	1173.9	2431.0
253	42.333	.001138	.04114	.04228	1066.72	1541.2	2609.9	2.7293	2.9913	5.6676	1061.90	1169.0	2430.9
254	43.047	.001140	.04041	.04155	1071.56	1534.2	2609.8	2.7385	2.9963	5.6638	1066.65	1164.2	2430.9
255	43.771	.001143	.03973	.04087	1076.42	1527.2	2609.6	2.7476	2.9913	5.6600	1071.41	1159.3	2430.7
256	44.503	.001146	.03901	.04015	1081.29	1520.1	2609.4	2.7576	2.9863	5.6562	1076.19	1154.5	2430.7
257	45.246	.001149	.03833	.03948	1086.16	1513.0	2609.2	2.7676	2.9813	5.6523	1080.97	1154.6	2430.6
258	45.997	.001152	.03765	.03880	1091.06	1505.9	2609.0	2.7772	2.9763	5.6485	1085.76	1144.8	2430.5
259	46.757	.001155	.03701	.03816	1095.96	1498.8	2608.7	2.7875	2.9712	5.6447	1090.56	1139.7	2430.3
260	47.527	.001157	.03637	.03753	1100.87	1491.6	2608.4	2.7974	2.9661	5.6408	1095.37	1134.7	2430.1
261	48.307	.001160	.03573	.03689	1105.79	1484.5	2608.1	2.8079	2.9610	5.6369	1100.19	1129.7	2429.9
262	49.090	.001163	.03510	.03626	1110.73	1477.0	2607.8	2.8181	2.9559	5.6330	1105.02	1124.7	2429.8
263	49.875	.001166	.03448	.03565	1115.67	1469.7	2607.4	2.8282	2.9508	5.6291	1109.85	1119.7	2429.5
264	50.703	.001169	.03389	.03506	1120.63	1462.4	2607.0	2.8386	2.9456	5.6252	1114.70	1114.5	2429.2
265	51.521	.001172	.03329	.03446	1125.60	1455.0	2606.5	2.8488	2.9404	5.6212	1119.56	1109.4	2429.0
266	52.350	.001175	.03271	.03388	1130.58	1447.5	2606.1	2.8590	2.9352	5.6173	1124.43	1104.3	2428.7
267	53.168	.001178	.03216	.03333	1135.58	1440.0	2605.6	2.8693	2.9300	5.6134	1129.31	1099.9	2428.3
268	54.026	.001181	.03159	.03277	1140.59	1432.4	2605.0	2.8795	2.9247	5.6095	1134.21	1095.7	2427.9
269	54.895	.001184	.03103	.03221	1145.61	1424.8	2604.4	2.8897	2.9194	5.6057	1139.11	1090.5	2427.6
270	55.763	.001187	.03050	.03169	1150.64	1417.2	2603.8	2.8999	2.9140	5.6018	1144.02	1085.1	2427.1
271	56.642	.001190	.02997	.03116	1155.67	1409.4	2603.1	2.9103	2.9086	5.5979	1148.95	1079.7	2426.6
272	57.532	.001193	.02946	.03065	1160.75	1401.7	2602.4	2.9206	2.9032	5.5939	1153.89	1074.2	2426.1
273	58.432	.001196	.02894	.03013	1165.82	1393.9	2601.7	2.9310	2.8977	5.5899	1158.84	1068.8	2425.6
274	59.342	.001199	.02846	.02965	1170.91	1386.0	2600.9	2.9414	2.8921	5.5859	1163.80	1063.1	2424.9
275	60.262	.001202	.02796	.02917	1176.01	1378.1	2600.1	2.9519	2.8866	5.5819	1168.77	1057.5	2424.3
276	61.194	.001205	.02746	.02866	1181.13	1370.1	2599.2	2.9623	2.8809	5.5777	1173.75	1051.0	2423.8
277	62.136	.001208	.02698	.02819	1186.27	1362.0	2598.3	2.9728	2.8752	5.5734	1178.76	1044.4	2423.1
278	63.090	.001211	.02650	.02771	1191.41	1353.9	2597.3	2.9832	2.8695	5.5691	1183.77	1038.7	2422.5
279	64.054	.001214	.02605	.02726	1196.58	1345.7	2596.3	2.9937	2.8637	5.5647	1188.80	1032.9	2421.7
280	65.029	.001217	.02560	.02682	1201.76	1337.5	2595.2	2.9990	2.8578	5.5603	1193.84	1027.0	2420.8
281	66.015	.001220	.02515	.02637	1206.95	1329.2	2594.1	3.0043	2.8519	5.5558	1198.89	1021.1	2420.0
282	67.013	.001224	.02470	.02592	1212.16	1320.8	2593.0	3.0096	2.8460	5.5513	1203.95	1015.3	2419.3
283	68.022	.001227	.02427	.02550	1217.39	1312.4	2591.7	3.0149	2.8400	5.5468	1209.05	1009.3	2418.3
284	69.042	.001230	.02384	.02507	1222.64	1303.9	2590.5	3.0202	2.8340	5.5423	1214.15	1003.3	2417.4
285	70.074	.001233	.02342	.02465	1227.90	1295.3	2589.2	3.0255	2.8277	5.5377	1219.26	997.2	2416.4
286	71.118	.001236	.02301	.02424	1233.18	1286.6	2587.8	3.0307	2.8214	5.5331	1224.39	991.0	2415.4
287	72.173	.001240	.02260	.02384	1238.48	1277.9	2586.4	3.0361	2.8151	5.5285	1229.53	984.8	2414.4
288	73.240	.001243	.02221	.02345	1243.80	1269.1	2584.9	3.0415	2.8087	5.5239	1234.70	978.5	2413.2
289	74.318	.001246	.02180	.02304	1249.14	1260.3	2583.4	3.0469	2.8023	5.5193	1239.87	972.3	2412.1
290	75.408	.001250	.02140	.02265	1254.49	1251.3	2581.8	3.0523	2.7958	5.5146	1245.07	965.9	2411.0
291	76.512	.001253	.02103	.02229	1259.87	1242.0	2580.2	3.0577	2.7892	5.5099	1250.28	959.4	2409.7
292	77.626	.001257	.02065	.02191	1265.27	1232.2	2578.5	3.0631	2.7825	5.5052	1255.51	952.9	2408.4
293	78.754	.001260	.02028	.02154	1270.69	1222.1	2576.8	3.0685	2.7758	5.5005	1260.76	946.4	2407.1
294	79.894	.001264	.01994	.02121	1276.12	1211.8	2574.9	3.0738	2.7690	5.4958	1266.03	939.5	2405.5
295	81.044	.001267	.01955	.02082	1281.58	1201.5	2573.1	3.0792	2.7622	5.4911	1271.31	933.0	2404.3
296	82.209	.001271	.01919	.02046	1287.07	1191.1	2571.2	3.0846	2.7553	5.4864	1276.62	926.3	2403.0
297	83.387	.001274	.01884	.02012	1292.57	1180.6	2569.2	3.0900	2.7484	5.4817	1281.95	919.5	2401.4
298	84.578	.001278	.01850	.01978	1298.10	1169.9	2567.1	3.0954	2.7415	5.4770	1287.30	912.6	2399.8
299	85.781	.001282	.01818	.01946	1303.66	1159.4	2565.0	3.1008	2.7345	5.4723	1292.66	905.4	2398.1

°C	Pres. Bar	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg°K			Energ. Interna kJ/kg		
		V _s	ΔV	V ¹ _s	i _s	L	i ¹ _s	S _s	L/T	S ¹ _s	u _s	Δu	u ¹ _s
300	86.997	.001285	.01784	.01912	1309.23	1173.6	2562.9	3.1702	2.1351	5.3570	1298.05	1068.4	2366.5
301	88.226	.001289	.01749	.01878	1314.84	1245.6	2563.6	3.1703	2.1361	5.3593	1303.46	1061.4	2344.9
302	89.489	.001293	.01715	.01845	1320.07	1237.9	2564.3	3.1704	2.1372	5.3615	1308.91	1054.3	2323.2
303	90.785	.001297	.01682	.01814	1325.12	1229.6	2565.0	3.1705	2.1383	5.3637	1314.31	1047.0	2301.4
304	91.995	.001300	.01653	.01783	1331.60	1221.7	2565.5	3.1706	2.1395	5.3658	1319.65	1039.6	2279.5
305	93.277	.001304	.01620	.01751	1337.91	1212.6	2566.1	3.1707	2.0396	5.3679	1325.35	1032.4	2257.8
306	94.575	.001308	.01591	.01722	1344.25	1203.3	2566.5	3.1708	2.0397	5.3699	1330.38	1024.8	2235.7
307	95.626	.001312	.01560	.01691	1350.62	1194.9	2566.9	3.1709	2.0398	5.3716	1335.44	1017.3	2213.7
308	97.212	.001316	.01539	.01661	1356.82	1185.4	2567.2	3.1710	2.0399	5.3735	1340.47	1009.7	2191.8
309	98.551	.001320	.01500	.01632	1360.65	1179.8	2567.4	3.1710	2.0399	5.3754	1344.65	1002.0	2169.6
310	99.905	.001325	.01471	.01604	1366.91	1171.1	2567.6	3.1711	2.0399	5.3771	1353.37	1004.1	2177.4
311	101.27	.001329	.01441	.01574	1372.41	1162.3	2567.7	3.1712	1.9953	5.3687	1358.55	1016.4	2179.3
312	102.56	.001333	.01413	.01547	1375.91	1153.4	2567.8	3.1712	1.9970	5.3692	1364.33	1008.4	2173.0
313	104.05	.001337	.01385	.01519	1379.30	1144.4	2567.9	3.1712	1.9513	5.3517	1370.78	1000.3	2166.7
314	105.47	.001342	.01356	.01491	1384.99	1135.3	2568.0	3.1713	1.9327	5.3431	1376.14	992.3	2160.4
315	106.89	.001346	.01330	.01465	1390.33	1126.1	2568.5	3.1713	1.9138	5.3345	1381.94	984.0	2153.9
316	108.34	.001351	.01302	.01437	1396.07	1116.8	2568.9	3.1714	1.8947	5.3257	1387.77	975.8	2147.5
317	109.80	.001355	.01275	.01410	1400.91	1107.4	2569.0	3.1714	1.8755	5.3169	1393.04	967.4	2141.1
318	111.27	.001360	.01249	.01385	1404.67	1097.5	2569.2	3.1715	1.8562	5.3080	1398.34	958.8	2134.6
319	112.76	.001365	.01223	.01359	1409.07	1088.2	2569.0	3.1715	1.8366	5.2990	1403.48	950.3	2128.0
320	114.27	.001370	.01197	.01334	1412.11	1078.4	2569.5	3.1717	1.8172	5.2899	1411.36	941.6	2121.3
321	115.79	.001374	.01171	.01309	1415.40	1068.5	2569.9	3.1717	1.7974	5.2803	1417.68	932.8	2114.3
322	117.33	.001379	.01146	.01283	1418.71	1058.4	2570.2	3.1717	1.7778	5.2705	1423.55	924.0	2107.5
323	118.85	.001384	.01120	.01259	1422.12	1048.3	2570.4	3.1717	1.7577	5.2602	1429.07	915.1	2100.8
324	120.45	.001390	.01095	.01235	1425.54	1038.0	2570.5	3.1717	1.7374	5.2505	1435.50	905.9	2094.1
325	122.04	.001395	.01073	.01212	1429.02	1027.6	2570.5	3.1718	1.7171	5.2403	1442.00	896.6	2087.6
326	123.65	.001400	.01047	.01187	1432.55	1017.0	2570.6	3.1718	1.6968	5.2308	1448.25	887.5	2081.7
327	125.27	.001406	.01023	.01164	1436.16	1006.3	2570.5	3.1718	1.6759	5.2201	1454.55	878.1	2075.6
328	126.91	.001411	.01000	.01141	1439.81	995.5	2570.5	3.1718	1.6551	5.2103	1461.07	868.5	2069.4
329	128.57	.001417	.00977	.01119	1443.52	984.5	2570.0	3.1718	1.6341	5.2005	1467.30	858.9	2063.2
330	130.25	.001423	.00955	.01095	1447.20	973.3	2569.6	3.1718	1.6130	5.0746	1473.77	849.2	2057.0
331	131.95	.001429	.00929	.01072	1449.14	962.0	2569.2	3.1719	1.5916	5.0545	1480.29	839.4	2050.7
332	133.66	.001435	.00909	.01052	1453.05	950.6	2568.6	3.1719	1.5700	5.0344	1486.83	829.1	2044.0
333	135.39	.001441	.00886	.01030	1456.94	938.9	2568.0	3.1719	1.5483	5.0141	1493.53	818.0	2037.5
334	137.15	.001447	.00864	.01008	1460.10	927.1	2567.2	3.1719	1.5265	5.0036	1500.25	806.7	2030.9
335	138.92	.001453	.00841	.00987	1462.24	915.2	2567.4	3.1720	1.5041	5.0033	1507.05	795.3	2024.3
336	140.71	.001460	.00820	.00966	1464.46	903.0	2567.5	3.1721	1.4817	5.0028	1513.92	783.6	2017.5
337	142.52	.001466	.00798	.00945	1466.17	890.6	2567.4	3.1721	1.4590	5.0021	1520.87	771.8	2010.7
338	144.35	.001473	.00777	.00925	1468.18	878.1	2567.3	3.1722	1.4361	5.0113	1527.91	759.9	2003.8
339	146.20	.001480	.00756	.00904	1470.65	865.3	2567.0	3.1724	1.4129	5.0004	1535.03	747.8	1996.8
340	148.08	.001487	.00735	.00884	1474.26	852.4	2566.6	3.1725	1.3895	4.9893	1542.25	735.5	1989.7
341	149.97	.001495	.00715	.00865	1477.99	839.2	2566.1	3.1726	1.3658	4.9781	1549.57	723.9	1982.5
342	151.89	.001502	.00694	.00844	1479.82	825.7	2565.6	3.1727	1.3417	4.9668	1557.00	712.4	1975.4
343	153.83	.001510	.00674	.00825	1487.77	812.1	2565.0	3.1728	1.3173	4.9554	1564.54	700.4	1968.0
344	155.79	.001517	.00654	.00805	1495.84	798.1	2564.0	3.1729	1.2926	4.9437	1572.20	688.3	1960.7
345	157.77	.001525	.00633	.00786	1504.05	783.9	2563.0	3.1730	1.2676	4.9320	1579.99	676.0	1953.0
346	159.77	.001533	.00614	.00767	1512.42	769.4	2561.8	3.1731	1.2421	4.9200	1587.92	663.3	1945.2
347	161.80	.001542	.00593	.00748	1520.95	754.6	2560.6	3.1732	1.2162	4.9079	1595.80	650.5	1937.6
348	163.86	.001550	.00575	.00730	1529.64	739.5	2559.1	3.1733	1.1899	4.8958	1603.84	637.3	1929.5
349	165.93	.001559	.00554	.00710	1538.52	724.0	2558.5	3.1734	1.1632	4.8831	1612.55	623.1	1921.7

°C	Pres. Bar	Volumen m ³ /kg			Entalpía kJ/kg			Entropía kJ/kg·°K			Energ. Interna kJ/kg		
		V _s	ΔV	V _s ¹	i _s	L	i _s ¹	S _s	L/T	S _s ¹	u _s	Δu	u _s ¹
350	166.04	.001566	.00324	.00690	1647.59	708.1	2355.7	3.7345	1.1350	4.8703	1621.65	618.5	2239.7
351	170.17	.001577	.00316	.00673	1638.69	691.9	2343.8	3.7474	1.1056	4.8574	1630.66	604.1	2234.8
352	172.32	.001586	.00496	.00655	1636.42	675.2	2341.6	3.7606	1.0795	4.8442	1637.09	589.7	2228.8
353	174.50	.001596	.00477	.00636	1636.21	658.0	2339.2	3.7802	1.0564	4.8307	1643.37	574.8	2223.2
354	176.71	.001605	.00457	.00618	1636.29	640.4	2326.7	3.7963	1.0266	4.8169	1657.92	559.6	2217.5
355	178.95	.001615	.00438	.00599	1636.65	622.2	2318.8	3.8139	.9910	4.8028	1667.74	545.8	2211.6
356	181.22	.001625	.00418	.00581	1707.38	603.3	2310.7	3.8298	.9585	4.7884	1677.92	527.6	2205.5
357	183.52	.001636	.00398	.00562	1718.31	583.8	2302.3	3.8475	.9260	4.7735	1688.49	510.7	2199.2
358	185.86	.001646	.00379	.00543	1730.09	563.5	2293.6	3.8659	.8938	4.7582	1699.50	493.1	2192.6
359	188.22	.001657	.00358	.00524	1742.15	542.3	2284.5	3.8849	.8615	4.7425	1710.98	474.9	2185.9
360	190.62	.001668	.00337	.00504	1754.78	520.2	2275.0	3.9049	.8213	4.7262	1722.99	455.9	2178.9
361	193.07	.001683	.00317	.00485	1768.06	497.0	2265.1	3.9256	.7834	4.7092	1735.56	435.9	2171.4
362	195.55	.001706	.00295	.00466	1782.68	472.5	2254.6	3.9479	.7436	4.6915	1748.67	414.8	2163.5
363	198.03	.001741	.00273	.00447	1796.90	446.6	2243.5	3.9712	.7018	4.6729	1762.40	392.6	2155.0
364	200.65	.001785	.00250	.00429	1812.71	419.0	2231.7	3.9960	.6573	4.6533	1776.69	368.8	2145.7
365	203.30	.001840	.00226	.00410	1829.71	389.3	2219.0	4.0226	.6098	4.6324	1792.30	343.3	2135.6
366	205.91	.001909	.00202	.00393	1849.29	356.9	2205.2	4.0517	.5581	4.6098	1809.97	315.3	2124.2
367	208.80	.001994	.00176	.00375	1886.85	321.0	2189.9	4.0838	.5012	4.5850	1827.25	284.3	2111.6
368	211.67	.002039	.00148	.00358	1892.15	280.3	2172.5	4.1202	.4370	4.5572	1847.72	249.0	2096.7
369	214.64	.002234	.00118	.00341	1919.65	232.3	2152.0	4.1630	.3616	4.5246	1871.70	207.1	2078.8
370	217.75	.002420	.00083	.00325	1954.75	171.0	2129.8	4.2175	.2658	4.4833	1902.05	153.0	2055.1
371	221.02	.002878	.00012	.00299	2041.02	24.6	2055.7	4.3440	.0583	4.3803	1977.39	22.1	1999.5
371.1	221.36	.002955	.00000	.00295	2055.52	.0	2055.5	4.3556	.0100	4.3556	1990.12	.0	1990.1

12-p.20 a 27

TABLA DE VOLUMENES ESPECÍFICOS, ENTALPIAS Y ENTROPIAS PARA D₂O POR DEBAJO DE LA PRESION DE SATURACION

T (° F)	P absoluta (lb/in ²)	Vol. específico : (ft ³ /lb)		Entalpia (BTU/lb)			Entropía (BTU/°F.lb)		
		Líquido	Vapor	Líquido	Evaporación	Vapor	Líquido	Evaporación	Vapor
38,84 41	0,09714 0,10596	0,01449 0,01449	2286,8 2565,4	- 26,40 - 24,26	997,79 996,50	971,39 972,24	0,076 0,081	2,002 1,990	2,079 2,072
50	0,15137	0,01449	1827,3	- 15,25	991,14	975,89	0,0989	1,9445	2,0434
60	0,22087	0,01449	1235,3	- 5,40	985,34	978,94	0,1183	1,8951	2,0133
70	0,31731	0,01450	907,20	- 4,58	979,38	983,96	0,1374	1,8474	1,9848
80	0,44841	0,01451	655,33	14,66	973,29	987,95	0,1562	1,8016	1,9578
90	0,62436	0,01453	477,42	24,81	967,10	981,91	0,1748	1,7574	1,9322
100	0,85719	0,01456	353,92	35,00	960,84	995,85	0,1931	1,7149	1,9079
110	1,1611	0,01459	265,73	45,21	954,54	999,76	0,2110	1,6738	1,8848
120	1,5536	0,01461	201,87	55,42	948,22	1003,64	0,2286	1,6342	1,8628
130	2,0552	0,01465	155,14	65,61	941,88	1007,50	0,2459	1,5960	1,8419
140	2,6894	0,01469	120,45	75,77	935,55	1011,32	0,2629	1,5591	1,8220
150	3,4828	0,01473	94,494	85,90	929,22	1015,11	0,2795	1,5234	1,8029
160	4,4666	0,01478	74,811	95,97	922,90	1018,87	0,2958	1,4489	1,7847
170	5,6754	0,01483	59,758	105,99	916,59	1022,58	0,3118	1,4554	1,7672
180	7,1486	0,01488	48,132	115,96	910,29	1026,26	0,3274	1,4231	1,7505
190	8,9297	0,01494	39,074	125,88	904,00	1029,88	0,3427	1,3917	1,7344
200	11,066	0,01499	31,959	135,75	897,71	1033,46	0,3577	1,3012	1,7189
210	13,613	0,01505	26,323	145,57	891,42	1036,98	0,3724	1,3316	1,7040
220	16,628	0,01511	21,827	155,34	885,11	1040,45	0,3867	1,3028	1,6896
230	20,175	0,01518	18,213	165,08	878,77	1043,85	0,4006	1,2748	1,6757
240	24,321	0,01525	15,288	174,79	872,39	1047,18	0,4146	1,2475	1,6622
250	29,143	0,01533	12,906	184,48	865,95	1050,43	0,4282	1,2209	1,6491
260	34,719	0,01540	10,952	194,16	859,45	1053,61	0,4415	1,1949	1,6364
270	41,122	0,01548	9,3436	203,84	852,86	1056,71	0,4545	1,1695	1,6240
280	48,461	0,01556	8,0088	213,53	846,18	1059,71	0,4674	1,1446	1,6120
290	56,911	0,01564	6,8885	223,24	839,38	1062,62	0,4801	1,1202	1,6002
300	66,508	0,01573	5,9466	232,99	832,44	1065,43	0,4926	1,0962	1,5888
310	77,183	0,01582	5,1652	242,77	825,36	1068,13	0,5049	1,0727	1,5776
320	89,146	0,01592	4,5101	252,61	818,11	1070,72	0,5171	1,0496	1,5667
330	102,67	0,01602	3,9466	262,51	810,67	1073,19	0,5293	1,0268	1,5561
340	117,82	0,01612	3,4628	272,49	803,04	1075,53	0,5413	1,0043	1,5457

T (° F)	P absoluta (lb/in²)	Vol específico : (ft³/lb)		Entalpía (BTU/lb)		Entropía (BTU/°F.lb)			
		Líquido	Vapor	Líquido	Evaporación	Vapor	Líquido	Evaporación	Vapor
350	134,66	0,01625	3,0488	282,55	795,19	1077,74	0,5533	0,9822	1,5355
360	153,36	0,01635	2,6928	292,70	787,11	1079,81	0,5652	0,9603	1,5255
370	174,04	0,01646	2,3856	302,95	778,78	1081,73	0,5771	0,9386	1,5157
380	196,84	0,01658	2,1193	313,30	770,19	1083,49	0,5890	0,9172	1,5061
390	221,92	0,01670	1,8871	323,77	761,32	1085,09	0,6008	0,8959	1,4968
400	249,48	0,01684	1,6829	334,36	752,16	1086,51	0,6127	0,8748	1,4876
410	279,65	0,01698	1,5044	345,06	742,70	1087,76	0,6247	0,8539	1,4786
420	312,50	0,01712	1,3506	355,88	732,92	1088,81	0,6366	0,8331	1,4697
430	348,25	0,01727	1,2153	366,83	722,82	1089,65	0,6486	0,8123	1,4610
440	387,08	0,01742	1,0934	377,90	712,38	1090,27	0,6607	0,7917	1,4524
450	429,15	0,01759	0,98539	389,08	701,58	1090,66	0,6728	0,7712	1,4439
460	474,65	0,01777	0,89008	400,38	690,44	1090,81	0,6849	0,7507	1,4356
470	522,78	0,01795	0,80509	411,78	678,92	1090,70	0,6970	0,7303	1,4273
480	576,73	0,01813	0,72917	423,28	667,03	1090,32	0,7092	0,7099	1,4190
490	633,66	0,01833	0,66187	434,87	654,76	1089,64	0,7213	0,6895	1,4108
500	694,75	0,01854	0,60145	446,54	642,11	1088,65	0,7334	0,6692	1,4025
510	760,22	0,01876	0,54599	458,27	629,06	1087,33	0,7454	0,6488	1,3942
520	830,32	0,01900	0,49598	474,04	615,62	1085,66	0,7573	0,6285	1,3858
530	905,31	0,01924	0,45160	481,84	601,77	1083,61	0,7690	0,6082	1,3771
540	985,40	0,01951	0,41140	493,64	587,52	1081,16	0,7805	0,5878	1,3683
550	1070,8	0,01980	0,37453	505,43	572,85	1078,28	0,7916	0,5675	1,3591
560	1161,6	0,02010	0,34097	517,17	557,77	1074,94	0,8025	0,5472	1,3496
570	1258,2	0,02041	0,31048	528,84	542,28	1071,12	0,8128	0,5268	1,3396
580	1360,8	0,02074	0,28271						
590	1469,7	0,02111	0,25754						
600	1583,3	0,02150	0,23498						
610	1708,1	0,02205	0,21301						
620	1838,3	0,02278	0,19069						
630	1976,3	0,02338	0,17119						
640	2122,2	0,02379	0,15537						
650	2276,7	0,02446	0,14090						
660	2440,2	0,02539	0,12623						
670	2614,0	0,02581	0,11010						
680	2797,5	0,02799	0,09278						
690	2989,7	0,03533	0,07537						

VALORES DE ENTALPIAS Y ENTROPIAS PARA D₂O DEBAJO DE LA PRESION DE SATURACION

T (°F)	P. absoluta (Lb./in ²)	Entalpía (BTU/Lb)			Entropía (BTU/Lb. °F)		
		Líquido	Evaporación	Vapor	Líquido	Evaporación	Vapor s _g
38,87	0,068	0,00	997,36	997,36	0,0000	2,0005	2,0005
40	0,080	1,14	996,65	997,79	0,0023	1,9945	1,9968
50	0,178	11,26	990,41	1001,67	0,0223	1,9432	1,9655
60	0,271	21,36	984,23	1005,59	0,0420	1,8940	1,9360
70	0,368	31,45	978,10	1009,55	0,0612	1,8466	1,9078
80	0,484	41,52	972,02	1013,54	0,0800	1,8011	1,8811
90	0,634	51,57	965,97	1017,54	0,0985	1,7573	1,8558
100	0,834	61,62	959,94	1021,56	0,1166	1,7151	1,8317
110	1,103	71,65	953,93	1025,58	0,1344	1,6745	1,8089
120	1,462	81,66	947,95	1029,61	0,1518	1,6353	1,7871
130	1,935	91,66	941,96	1033,62	0,1689	1,5974	1,7663
140	2,548	101,65	935,97	1037,62	0,1857	1,5608	1,7465
150	3,330	111,63	929,97	1041,60	0,2022	1,5253	1,7275
160	4,313	121,60	923,95	1045,55	0,2184	1,4910	1,7094
170	5,531	131,55	917,90	1049,45	0,2343	1,4577	1,6920
180	7,023	141,50	911,82	1053,32	0,2500	1,4254	1,6754
190	8,830	151,45	905,70	1057,15	0,2654	1,3940	1,6594
200	11,000	161,39	899,53	1060,92	0,2806	1,3636	1,6442
210	13,580	171,33	893,30	1064,63	0,2956	1,3339	1,6295
220	16,627	181,26	887,00	1068,26	0,3103	1,3050	1,6153
230	20,197	191,20	880,64	1071,84	0,3248	1,2769	1,6017
240	24,355	201,14	874,19	1075,33	0,3391	1,2494	1,5885
250	26,169	211,09	867,66	1078,75	0,3525	1,2226	1,5751
260	34,714	221,04	861,03	1082,07	0,3671	1,1964	1,5635
270	41,070	231,00	854,30	1085,30	0,3809	1,1708	1,5517

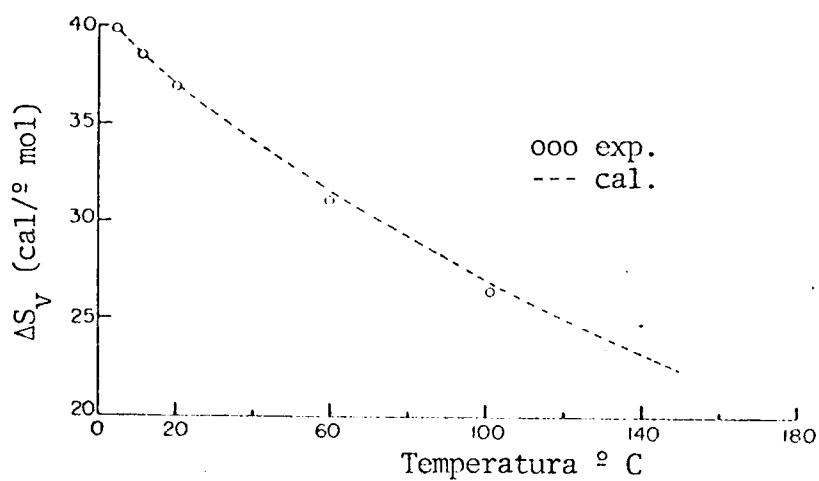
T (°F)	P. absoluta (Lb/In ²)	Entalpía (BTU/Lb)			Entropía (BTU/Lb °F)		
		Líquido	Evaporación	Vapor	Líquido	Evaporación	Vapor s _g
280	48,322	240,96	847,46	1088,42	0,3945	1,1457	1,5402
290	56,563	250,93	840,50	1091,45	0,4079	1,1211	1,5290
300	65,892	260,92	833,41	1094,33	0,4211	1,0970	1,5181
310	76,416	270,92	826,19	1097,11	0,4342	1,0734	1,5076
320	88,249	280,94	818,83	1099,77	0,4471	1,0502	1,4973
330	101,51	290,99	811,32	1102,32	0,4599	1,0274	1,4873
340	116,34	301,07	803,65	1104,72	0,4726	1,0050	1,4776
350	132,86	311,18	795,82	1107,00	0,4852	0,9829	1,4681
360	151,24	321,34	787,82	1109,16	0,4976	0,9611	1,4587
370	171,62	331,55	779,64	1111,19	0,5100	0,9397	1,4497
380	194,17	341,83	771,27	1113,10	0,5223	0,9185	1,4408
390	219,08	352,20	762,70	1114,90	0,5346	0,8976	1,4322
400	246,54	362,66	753,93	1116,59	0,5468	0,8770	1,4238
410	276,37	373,21	744,95	1118,16	0,5590	0,8566	1,4156
420	308,83	383,86	735,75	1119,61	0,5712	0,8364	1,4076
430	344,22	394,61	725,33	1120,94	0,5834	0,8164	1,3998
440	382,70	405,49	716,66	1122,15	0,5955	0,7966	1,3921
450	424,39	416,48	706,72	1123,20	0,6076	0,7769	1,3845
460	469,44	427,58	696,47	1124,05	0,6197	0,7573	1,3770
470	518,03	438,81	685,91	1124,72	0,6319	0,7378	1,3697
480	570,32	450,18	674,95	1125,13	0,6441	0,7183	1,3624
490	626,48	461,69	663,55	1125,24	0,6563	0,6987	1,3550
500	686,73	473,36	651,74	1125,10	0,6685	0,6791	1,3476
510	761,24	485,08	639,40	1124,48	0,6808	0,6594	1,3402
520	820,26	497,08	626,56	1123,64	0,6931	0,6395	1,3326

T (°F)	P. absoluta (Lb/I.Á)	Entalpía (BTU/Lb)			Entropía (BTU/Lb.°F)		
		Líquido	Evaporación	Vapor	Líquido	Evaporación	Vapor s _g
530	893,99	509,26	613,16	1122,42	0,7055	0,6195	1,3250
540	972,68	521,64	599,16	1120,80	0,7179	0,5993	1,3172
550	1036,6	534,23	584,51	1118,74	0,7304	0,5789	1,3093
560	1146,0	547,04	569,14	1116,18	0,7431	0,5582	1,3013
570	1241,1	560,09	552,96	1113,05	0,7558	0,5370	1,2928
580	1342,4	573,40	535,92	1109,32	0,7687	0,5155	1,2842
590	1450,0	587,01	517,99	1105,00	0,7817	0,4935	1,2752
600	1564,3	601,01	499,09	1100,10	0,7950	0,4710	1,2660
610	1685,6	615,46	479,16	1094,62	0,8085	0,4479	1,2564
620	1814,5	630,46	458,16	1088,62	0,8225	0,4243	1,2468
630	1951,1	646,06	435,92	1081,98	0,8369	0,4000	1,2369
640	2095,9	662,26	412,30	1074,56	0,8517	0,3749	1,2266
650	2249,5	679,16	387,32	1066,48	0,8670	0,3490	1,2160
660	2412,1	696,76	360,81	1057,57	0,8827	0,3222	1,2049
670	2584,2	715,21	332,72	1047,93	0,8991	0,2945	1,1936
680	2766,5	734,59	298,83	1033,99	0,9248	0,2627	1,1875
690	2959,4	834,83	191,42	1026,25	1,0102	0,1665	1,1760
699,44	3151,7	1019,83	0,00	1019,83	1,1728	0,00	1,1728

ENTALPIA DEL D_2O Kcal/kg

P. kg/cm ²	Temperatura , °C									
	150	200	250	300	350	400	450	500	550	
1	613.9	636.2	658.8	681.5	704.8	728.5	752.7	777.5	802.7	
5	613.8	636.1	658.5	681.4	704.5	728.5	752.8	777.4	802.8	
		631.6	655.7	679.4	703.6	727.4	751.8	776.7	802.0	
10		631.8	655.2	679.0	703.1	727.1	751.7	776.6	802.0	
		625.5	651.7	676.6	701.0	725.6	750.4	775.5	801.1	
50		625.7	651.2	676.0	700.8	725.3	750.3	775.3	801.0	
				649.8	682.2	711.5	739.2	766.3	793.3	
100				638.1	682.1	710.5	738.3	765.7	792.8	
					651.9	690.8	723.8	754.2	783.3	
150					651.8	689.9	722.5	753.3	782.3	
					605.1	665.6	706.3	740.9	772.7	
200					604.3	664.9	705.3	740.2	771.5	
						633.0	686.6	726.9	761.9	
250						632.1	686.0	725.9	761.0	
						585.7	664.0	711.5	750.2	
300						584.2	663.3	710.6	750.5	
							637.5	694.7	—	
							636.6	693.5		

15-p.157



Entropía de vaporización del D_2O .

6-p.1470

CALOR DE EVAPORACION (cal/ mol)

T (°C)	H ₂ O	D ₂ O
10	10,64	11,00
25	10,52	10,85
40	10,36	10,64
60	10,15	10,41
80	9,94	10,17
100	9,72	9,93
Entropía $S_{298,16}$ en unidades de entropía		
	16,75	18,9

13-p.71

PROPIEDADES TERMODINAMICAS DEL D₂O EN EL ESTADO DE SATURACION COMO UNA
FUNCION DE LA TEMPERATURA

Símbolos y unidades de parámetros en las tablas.

t — temperatura	— °C	v'', i'', s'' — magnitudes termodinámicas
p — presión	— Kg/cm ²	para el vapor saturado
v — volumen específico	— m ³ /kg	seco
i — entalpía	— kcal/kg	
s — entropía	— kcal/kg °	r — calor de vaporización — Kcal/kg

v', i', s' — magnitudes termodinámicas
para el líquido en ebullición.

t	p	v'	v''	i'	i''	r	s'	s''
3.8	0.00681	0.0009047	172.2	0.0	554.7	554.7	0.0000	2.0029
5	0.00734	0.0009045	160.4	1.2	555.1	553.9	0.0045	1.9959
6	0.00790	0.0009044	149.5	2.2	555.5	553.3	0.0080	1.9902
7	0.00850	0.0009043	139.4	3.2	555.9	552.7	0.0115	1.9845
8	0.00913	0.0009043	130.2	4.2	556.3	552.1	0.0150	1.9788
9	0.00980	0.0009042	121.8	5.2	556.7	551.5	0.0185	1.9732
10	0.01050	0.0009042	114.1	6.2	557.1	550.9	0.0220	1.9677
11	0.01125	0.0009042	106.9	7.2	557.5	550.3	0.0256	1.9623
12	0.01204	0.0009042	100.2	8.2	557.9	549.7	0.0291	1.9569
13	0.01289	0.0009042	93.92	9.2	558.3	549.1	0.0327	1.9516
14	0.01381	0.0009043	87.96	10.2	558.7	548.5	0.0362	1.9463
15	0.01478	0.0009043	82.48	11.2	559.1	547.9	0.0397	1.9411
16	0.01580	0.0009043	77.43	12.2	559.5	547.3	0.0432	1.9359
17	0.01689	0.0009044	72.70	13.2	559.9	546.7	0.0467	1.9309
18	0.01803	0.0009045	68.31	14.2	560.3	546.1	0.0502	1.9258
19	0.01923	0.0009046	64.25	15.2	560.7	545.5	0.0537	1.9207
20	0.02051	0.0009047	60.45	16.2	561.1	544.9	0.0572	1.9158
21	0.02188	0.0009048	57.01	17.2	561.5	544.3	0.0606	1.9109
22	0.02331	0.0009050	53.58	18.2	561.9	543.7	0.0640	1.9060
23	0.02483	0.0009051	50.48	19.2	562.3	543.1	0.0674	1.9012
24	0.02643	0.0009052	47.59	20.2	562.7	542.5	0.0708	1.8964
25	0.02812	0.0009054	44.88	21.2	563.1	541.9	0.0743	1.8917
26	0.02990	0.0009055	42.36	22.2	563.5	541.3	0.0777	1.8871
27	0.03178	0.0009057	39.98	23.2	563.9	540.7	0.0811	1.8824
28	0.03376	0.0009059	37.75	24.2	564.2	540.0	0.0845	1.8777

t	p	v'	v''	i'	i''	r	s'	s''
29	0.03584	0.0009061	35.68	25.2	564.6	539.4	0.0879	1.8731
30	0.03804	0.0009063	33.71	26.2	565.0	538.8	0.0912	1.8685
31	0.04036	0.0009065	31.87	27.2	565.4	538.2	0.0945	1.8640
32	0.04279	0.0009068	30.15	28.2	565.8	537.6	0.0978	1.8596
33	0.04535	0.0009070	28.53	29.2	566.2	537.0	0.1011	1.8551
34	0.04804	0.0009073	27.01	30.2	566.6	536.4	0.1044	1.8507
35	0.05088	0.0009075	25.59	31.2	567.0	535.8	0.1076	1.8463
36	0.05384	0.0009078	24.25	32.2	567.4	535.2	0.1109	1.8420
37	0.05697	0.0009081	22.99	33.2	567.8	534.6	0.1142	1.8378
38	0.06025	0.0009084	21.81	34.2	568.2	534.0	0.1175	1.8336
39	0.06368	0.0009087	20.70	35.2	568.6	533.4	0.1207	1.8294
40	0.06728	0.0009091	19.66	36.2	569.0	532.8	0.1239	1.8252
41	0.07106	0.0009094	18.67	37.2	569.4	532.2	0.1270	1.8210
42	0.07503	0.0009097	17.73	38.2	569.8	531.6	0.1302	1.8169
43	0.07918	0.0009101	16.85	39.2	570.1	530.9	0.1334	1.8128
44	0.08353	0.0009104	16.02	40.2	570.5	530.3	0.1366	1.8087
45	0.08808	0.0009108	15.24	41.2	570.9	529.7	0.1398	1.8046
46	0.09284	0.0009112	14.50	42.2	571.3	529.1	0.1429	1.8006
47	0.09783	0.0009115	13.80	43.2	571.7	528.5	0.1460	1.7967
48	0.10304	0.0009119	13.14	44.2	572.0	527.8	0.1491	1.7927
49	0.10849	0.0009123	12.52	45.2	572.4	527.2	0.1522	1.7888
50	0.11418	0.0009127	11.93	46.2	572.8	526.6	0.1553	1.7849
51	0.12013	0.0009131	11.38	47.2	573.2	526.0	0.1584	1.7811
52	0.12634	0.0009135	10.85	48.2	573.6	525.4	0.1615	1.7773
53	0.13282	0.0009139	10.35	49.2	574.0	524.8	0.1645	1.7736
54	0.13959	0.0009144	9.877	50.1	574.4	524.3	0.1675	1.7699
55	0.14664	0.0009148	9.431	51.1	574.8	523.7	0.1705	1.7662
56	0.15399	0.0009152	9.007	52.1	575.2	523.1	0.1735	1.7626
57	0.16167	0.0009157	8.603	53.1	575.6	522.5	0.1765	1.7590
58	0.16966	0.0009161	8.222	54.1	576.0	521.9	0.1795	1.7554
59	0.17799	0.0009166	7.859	55.1	576.4	521.3	0.1825	1.7518
60	0.18665	0.0009170	7.517	56.1	576.8	520.7	0.1855	1.7483
61	0.19570	0.0009175	7.188	57.1	577.2	520.1	0.1884	1.7449
62	0.2051	0.0009180	6.879	58.1	577.6	519.5	0.1914	1.7415
63	0.2148	0.0009185	6.586	59.1	578.0	518.9	0.1944	1.7379
64	0.2250	0.0009190	6.306	60.1	578.4	518.3	0.1973	1.7345
65	0.2356	0.0009195	6.039	61.1	578.8	517.7	0.2002	1.7311
66	0.2466	0.0009200	5.785	62.1	579.2	517.1	0.2032	1.7278
67	0.2581	0.0009205	5.543	63.1	579.6	516.5	0.2061	1.7245
68	0.2699	0.0009210	5.315	64.1	580.0	515.9	0.2090	1.7212
69	0.2823	0.0009215	5.097	65.1	580.4	515.3	0.2119	1.7179
70	0.2951	0.0009220	4.890	66.1	580.8	514.7	0.2149	1.7146
71	0.3084	0.0009225	4.691	67.1	581.1	514.0	0.2179	1.7113
72	0.3223	0.0009230	4.501	68.1	581.4	513.3	0.2208	1.7080
73	0.3366	0.0009236	4.322	69.1	581.8	512.7	0.2237	1.7048
74	0.3514	0.0009241	4.151	70.1	582.2	512.1	0.2265	1.7016
75	0.3669	0.0009246	3.986	71.1	582.6	511.5	0.2294	1.6984
76	0.3828	0.0009252	3.831	72.1	582.9	510.8	0.2323	1.6952
77	0.3991	0.0009257	3.680	73.1	583.3	510.2	0.2352	1.6921
78	0.4166	0.0009263	3.538	74.1	583.7	509.6	0.2381	1.6891
79	0.4343	0.0009268	3.403	75.1	584.0	508.9	0.2410	1.6861
80	0.4527	0.0009274	3.273	76.1	584.4	508.3	0.2438	1.6831
81	0.4718	0.0009280	3.149	77.1	584.7	507.6	0.2467	1.6800
82	0.4915	0.0009286	3.031	78.1	585.0	506.9	0.2496	1.6770
83	0.5120	0.0009292	2.917	79.1	585.4	506.3	0.2524	1.6740

t	p	v'	v''	l'	l''	r	s'	s''
84	0.5332	0.0009298	2.809	80.1	585.8	505.7	0.2552	1.6710
85	0.5550	0.0009304	2.705	81.1	586.2	505.1	0.2580	1.6681
86	0.5775	0.0009310	2.606	82.1	586.5	504.4	0.2603	1.6652
87	0.6008	0.0009317	2.512	83.1	586.8	503.7	0.2636	1.6624
88	0.6250	0.0009323	2.420	84.1	587.2	503.1	0.2664	1.6596
89	0.6500	0.0009330	2.332	85.1	587.6	502.5	0.2692	1.6568
90	0.6757	0.0009336	2.249	86.1	587.9	501.8	0.2720	1.6540
91	0.7023	0.0009342	2.169	87.1	588.3	501.2	0.2748	1.6512
92	0.7298	0.0009348	2.092	88.1	588.6	500.5	0.2776	1.6484
93	0.7582	0.0009355	2.018	89.1	589.0	499.9	0.2804	1.6456
94	0.7875	0.0009362	1.947	90.1	589.3	499.2	0.2832	1.6429
95	0.8177	0.0009369	1.880	91.1	589.7	498.6	0.2860	1.6402
96	0.8489	0.0009375	1.815	92.1	590.0	497.9	0.2887	1.6375
97	0.8811	0.0009382	1.752	93.1	590.4	497.3	0.2914	1.6349
98	0.9142	0.0009389	1.693	94.1	590.8	496.7	0.2941	1.6323
99	0.9484	0.0009396	1.636	95.1	591.2	496.1	0.2967	1.6297
100	0.9836	0.0009403	1.582	96.1	591.5	495.4	0.2994	1.6270
101	1.0200	0.0009410	1.529	97.1	591.9	494.8	0.3020	1.6244
102	1.0574	0.0009417	1.479	98.1	592.2	494.1	0.3047	1.6218
103	1.0960	0.0009424	1.430	99.2	592.6	493.4	0.3074	1.6192
104	1.1358	0.0009431	1.384	100.2	593.0	492.8	0.3101	1.6167
105	1.1766	0.0009438	1.339	101.2	593.3	492.1	0.3128	1.6142
106	1.2187	0.0009446	1.296	102.2	593.6	491.4	0.3155	1.6117
107	1.2621	0.0009454	1.254	103.2	594.0	490.8	0.3182	1.6092
108	1.3067	0.0009461	1.214	104.2	594.3	490.1	0.3208	1.6066
109	1.3526	0.0009469	1.175	105.2	594.6	489.4	0.3235	1.6041
110	1.3998	0.0009476	1.138	106.2	594.9	488.7	0.3261	1.6016
111	1.4483	0.0009484	1.102	107.2	595.3	488.1	0.3287	1.5991
112	1.4983	0.0009492	1.067	108.2	595.6	487.4	0.3313	1.5967
113	1.5497	0.0009499	1.034	109.2	596.0	486.8	0.3339	1.5943
114	1.6025	0.0009507	1.002	110.2	596.3	486.1	0.3365	1.5919
115	1.6567	0.0009515	0.9707	111.2	596.6	485.4	0.3391	1.5895
116	1.7125	0.0009523	0.9416	112.2	597.0	484.8	0.3417	1.5871
117	1.7698	0.0009532	0.9130	113.3	597.3	484.0	0.3443	1.5848
118	1.8286	0.0009540	0.8854	114.3	597.6	483.3	0.3470	1.5825
119	1.8891	0.0009548	0.8587	115.3	597.9	482.6	0.3496	1.5802
120	1.9511	0.0009556	0.8326	116.3	598.2	481.9	0.3522	1.5779
121	2.0149	0.0009565	0.8084	117.3	598.6	481.3	0.3546	1.5756
122	2.0802	0.0009573	0.7846	118.3	598.9	480.6	0.3572	1.5733
123	2.1474	0.0009582	0.7615	119.3	599.2	479.9	0.3597	1.5711
124	2.2163	0.0009590	0.7392	120.3	599.5	479.2	0.3623	1.5689
125	2.2869	0.0009599	0.7178	121.3	599.8	478.5	0.3649	1.5667
126	2.3595	0.0009608	0.6970	122.3	600.1	477.8	0.3675	1.5645
127	2.4338	0.0009617	0.6770	123.3	600.4	477.1	0.3700	1.5623
128	2.5101	0.0009625	0.6577	124.3	600.7	476.4	0.3725	1.5601
129	2.5883	0.0009634	0.6391	125.3	601.0	475.7	0.3751	1.5580
130	2.6685	0.0009643	0.6212	126.3	601.4	475.1	0.3776	1.5559
131	2.7506	0.0009652	0.6037	127.3	601.7	474.4	0.3801	1.5538
132	2.8349	0.0009661	0.5869	128.3	602.0	473.7	0.3826	1.5516
133	2.9214	0.0009670	0.5706	129.3	602.3	473.0	0.3851	1.5495
134	3.010	0.0009679	0.5549	130.3	602.6	472.3	0.3875	1.5474
135	3.100	0.0009688	0.5397	131.4	602.9	471.5	0.3900	1.5453
136	3.193	0.0009697	0.5249	132.4	603.2	470.8	0.3925	1.5432
137	3.288	0.0009707	0.5106	133.4	603.5	470.1	0.3950	1.5411
138	3.385	0.0009716	0.4969	134.4	603.8	469.4	0.3974	1.5390

t	p	v'	v''	l'	l''	r	s'	s''
139	3.485	0.0009726	0.4834	135.4	604.1	468.7	0.3998	1.5370
140	3.587	0.0009736	0.4705	136.4	604.5	468.1	0.4021	1.5350
141	3.691	0.0009745	0.4580	137.4	604.8	467.4	0.4045	1.5330
142	3.798	0.0009755	0.4459	138.4	605.1	466.7	0.4069	1.5310
143	3.908	0.0009769	0.4340	139.4	605.4	466.0	0.4092	1.5290
144	4.020	0.0009774	0.4226	140.4	605.7	465.3	0.4116	1.5270
145	4.134	0.0009784	0.4116	141.4	606.0	464.6	0.4139	1.5251
146	4.250	0.0009794	0.4010	142.4	606.4	464.0	0.4162	1.5232
147	4.370	0.0009804	0.3906	143.4	606.7	463.3	0.4186	1.5213
148	4.492	0.0009815	0.3807	144.4	607.0	462.6	0.4210	1.5194
149	4.617	0.0009825	0.3710	145.4	607.3	461.9	0.4234	1.5175
150	4.745	0.0009835	0.3616	146.4	607.5	461.1	0.4257	1.5155
151	4.876	0.0009846	0.3524	147.4	607.8	460.4	0.4280	1.5135
152	5.010	0.0009856	0.3435	148.4	608.1	459.7	0.4303	1.5115
153	5.146	0.0009866	0.3349	149.4	608.4	459.0	0.4326	1.5096
154	5.285	0.0009877	0.3266	150.4	608.7	458.3	0.4349	1.5078
155	5.427	0.0009888	0.3185	151.4	609.0	457.6	0.4372	1.5060
156	5.572	0.0009898	0.3107	152.4	609.3	456.9	0.4395	1.5041
157	5.721	0.0009909	0.3030	153.4	609.6	456.2	0.4418	1.5022
158	5.874	0.0009920	0.2956	154.4	609.9	455.5	0.4441	1.5004
159	6.028	0.0009931	0.2884	155.5	610.2	454.7	0.4464	1.4985
160	6.185	0.0009942	0.2815	156.5	610.5	454.0	0.4487	1.4966
161	6.347	0.0009953	0.2747	157.5	610.7	453.2	0.4509	1.4948
162	6.512	0.0009964	0.2681	158.5	611.0	452.5	0.4532	1.4930
163	6.680	0.0009975	0.2618	159.5	611.3	451.8	0.4554	1.4911
164	6.851	0.0009986	0.2556	160.6	611.5	450.9	0.4577	1.4893
165	7.027	0.0009997	0.2495	161.6	611.8	450.2	0.4600	1.4875
166	7.205	0.0010009	0.2437	162.6	612.1	449.5	0.4623	1.4857
167	7.387	0.0010020	0.2380	163.6	612.3	448.7	0.4646	1.4840
168	7.573	0.0010032	0.2325	164.6	612.5	447.9	0.4669	1.4822
169	7.763	0.0010044	0.2271	165.7	612.8	447.1	0.4692	1.4804
170	7.956	0.0010055	0.2218	166.7	613.0	446.3	0.4715	1.4786
171	8.153	0.0010067	0.2167	167.7	613.3	445.6	0.4737	1.4769
172	8.354	0.0010079	0.2117	168.7	613.5	444.8	0.4759	1.4751
173	8.558	0.0010091	0.2069	169.7	613.7	444.0	0.4782	1.4733
174	8.767	0.0010103	0.2022	170.8	613.9	443.1	0.4805	1.4715
175	8.980	0.0010115	0.1976	171.8	614.1	442.3	0.4828	1.4697
176	9.197	0.0010127	0.1931	172.8	614.4	441.6	0.4850	1.4680
177	9.418	0.0010139	0.1888	173.8	614.6	440.8	0.4873	1.4663
178	9.643	0.0010151	0.1846	174.9	614.7	439.8	0.4896	1.4645
179	9.873	0.0010163	0.1805	175.9	614.9	439.0	0.4919	1.4627
180	10.106	0.0010175	0.1765	177.0	615.0	438.0	0.4942	1.4609
181	10.344	0.0010188	0.1726	178.0	615.2	437.2	0.4965	1.4592
182	10.586	0.0010200	0.1689	179.0	615.4	436.4	0.4987	1.4575
183	10.833	0.0010213	0.1652	180.0	615.6	435.6	0.5009	1.4558
184	11.085	0.0010225	0.1616	181.0	615.8	434.8	0.5031	1.4541
185	11.341	0.0010238	0.1581	182.0	615.9	433.9	0.5054	1.4524
186	11.601	0.0010251	0.1548	183.1	616.0	432.9	0.5077	1.4507
187	11.866	0.0010264	0.1516	184.1	616.2	432.1	0.5100	1.4490
188	12.136	0.0010277	0.1484	185.1	616.3	431.2	0.5123	1.4473
189	12.411	0.0010290	0.1452	186.2	616.4	430.2	0.5146	1.4456
190	12.690	0.0010303	0.1422	187.3	616.6	429.3	0.5168	1.4439
191	12.975	0.0010317	0.1392	188.3	616.7	428.4	0.5191	1.4422
192	13.264	0.0010330	0.1363	189.3	616.8	427.5	0.5213	1.4405
193	13.559	0.0010343	0.1334	190.3	617.0	426.7	0.5235	1.4389

t	p	v'	v''	l'	l''	r	s'	s''
194	13.859	0.0010357	0.1306	191.3	617.1	425.8	0.5257	1.4372
195	14.164	0.0010370	0.1279	192.3	617.2	424.9	0.5279	1.4355
196	14.474	0.0010384	0.1253	193.4	617.4	424.0	0.5302	1.4339
197	14.789	0.0010397	0.1227	194.5	617.5	423.0	0.5325	1.4323
198	15.109	0.0010411	0.1202	195.5	617.6	422.1	0.5347	1.4307
199	15.435	0.0010425	0.1177	196.6	617.8	421.2	0.5369	1.4291
200	15.766	0.0010439	0.1153	197.6	618.0	420.4	0.5391	1.4276
201	16.104	0.0010453	0.1130	198.6	618.1	419.5	0.5414	1.4260
202	16.447	0.0010467	0.1107	199.7	618.2	418.5	0.5436	1.4244
203	16.794	0.0010482	0.1085	200.7	618.3	417.6	0.5458	1.4228
204	17.148	0.0010496	0.1063	201.7	618.4	416.7	0.5480	1.4212
205	17.508	0.0010510	0.1041	202.8	618.5	415.7	0.5502	1.4196
206	17.874	0.0010525	0.1020	203.8	618.6	414.8	0.5524	1.4180
207	18.246	0.0010539	0.1000	204.9	618.8	413.9	0.5546	1.4164
208	18.624	0.0010554	0.09804	206.0	618.9	412.9	0.5568	1.4149
209	19.010	0.0010569	0.09608	207.0	619.0	412.0	0.5589	1.4133
210	19.402	0.0010584	0.09420	208.1	619.2	411.1	0.5611	1.4118
211	19.799	0.0010599	0.09233	209.1	619.3	410.2	0.5631	1.4102
212	20.201	0.0010614	0.09051	210.2	619.4	409.2	0.5653	1.4087
213	20.610	0.0010629	0.08876	211.3	619.5	408.2	0.5675	1.4071
214	21.023	0.0010644	0.08704	212.4	619.6	407.2	0.5697	1.4056
215	21.445	0.0010660	0.08534	213.4	619.7	406.3	0.5719	1.4041
216	21.872	0.0010675	0.08368	214.5	619.8	405.3	0.5740	1.4026
217	22.307	0.0010691	0.08208	215.5	619.9	404.4	0.5762	1.4012
218	22.748	0.0010707	0.08052	216.6	620.0	403.4	0.5784	1.3997
219	23.195	0.0010723	0.07898	217.7	620.1	402.4	0.5806	1.3982
220	23.650	0.0010749	0.07746	218.8	620.2	401.4	0.5828	1.3967
221	24.111	0.0010755	0.07599	219.9	620.3	400.4	0.5850	1.3952
222	24.579	0.0010772	0.07456	221.0	620.4	399.4	0.5871	1.3937
223	25.053	0.0010789	0.07316	222.1	620.5	398.4	0.5892	1.3921
224	25.536	0.0010806	0.07177	223.2	620.6	397.4	0.5913	1.3906
225	26.026	0.0010823	0.07042	224.3	620.7	396.4	0.5934	1.3891
226	26.522	0.0010839	0.06910	225.4	620.8	395.4	0.5956	1.3876
227	27.026	0.0010857	0.06781	226.5	620.8	394.3	0.5978	1.3861
228	27.538	0.0010874	0.06654	227.6	620.9	393.3	0.6000	1.3847
229	28.056	0.0010892	0.06531	228.7	620.9	392.2	0.6022	1.3826
230	28.583	0.0010910	0.06411	229.8	621.0	391.2	0.6043	1.3818
231	29.115	0.0010928	0.06294	230.9	621.0	390.1	0.6064	1.3803
232	29.656	0.0010947	0.06179	232.0	621.1	389.1	0.6085	1.3788
233	30.205	0.0010966	0.06067	233.1	621.2	388.1	0.6107	1.3773
234	30.761	0.0010985	0.05956	234.2	621.2	387.0	0.6128	1.3759
235	31.326	0.0011005	0.05848	235.3	621.2	385.9	0.6150	1.3744
236	31.897	0.0011025	0.05743	236.4	621.2	384.8	0.6172	1.3729
237	32.477	0.0011045	0.05639	237.6	621.2	383.6	0.6194	1.3714
238	33.065	0.0011065	0.05537	238.7	621.2	382.5	0.6215	1.3699
239	33.662	0.0011085	0.05436	239.8	621.2	381.4	0.6236	1.3685
240	34.267	0.0011106	0.05340	240.9	621.3	380.4	0.6257	1.3670
241	34.880	0.0011126	0.05245	242.0	621.3	379.3	0.6273	1.3655
242	35.501	0.0011147	0.05152	243.1	621.3	378.2	0.6300	1.3641
243	36.131	0.0011168	0.05059	244.2	621.3	377.1	0.6321	1.3626
244	36.769	0.0011190	0.04971	245.4	621.3	375.9	0.6343	1.3611
245	37.415	0.0011212	0.04883	246.5	621.2	374.7	0.6365	1.3596
246	38.071	0.0011235	0.04797	247.6	631.2	373.6	0.6386	1.3581
247	38.736	0.0011259	0.04713	248.8	621.2	372.4	0.6407	1.3566
248	39.409	0.0011282	0.04631	249.9	621.2	371.3	0.6428	1.3552

t	p	v'	v''	i'	i''	r	s'	s''
249	40.09	0.0011305	0.04550	251.0	621.1	370.1	0.6449	1.3537
250	40.78	0.001133	0.04470	252.2	621.1	368.9	0.6471	1.3522
251	41.48	0.001136	0.04393	253.4	621.1	367.7	0.6493	1.3507
252	42.19	0.001138	0.04317	254.5	621.0	366.5	0.6514	1.3493
253	42.91	0.001140	0.04242	255.7	621.0	365.3	0.6535	1.3478
254	43.64	0.001143	0.04168	256.8	620.9	364.1	0.6556	1.3463
255	44.38	0.001146	0.04096	257.9	620.8	362.9	0.6578	1.3449
256	45.13	0.001148	0.04025	259.1	620.8	361.7	0.6599	1.3434
257	45.88	0.001151	0.03957	260.2	620.7	360.5	0.6620	1.3419
258	46.64	0.001154	0.03889	261.4	620.6	359.2	0.6641	1.3404
259	47.42	0.001156	0.03822	262.5	620.5	358.0	0.6662	1.3389
260	48.21	0.001159	0.03756	263.7	620.4	356.7	0.6684	1.3374
261	49.00	0.001162	0.03692	264.8	620.3	355.5	0.6705	1.3360
262	49.81	0.001164	0.03628	266.0	620.2	354.2	0.6726	1.3345
263	50.62	0.001167	0.03567	267.2	620.1	352.9	0.6748	1.3330
264	51.44	0.001170	0.03506	268.4	620.0	351.6	0.6769	1.3315
265	52.28	0.001172	0.03445	269.6	619.9	350.3	0.6790	1.3300
266	53.13	0.001175	0.03387	270.7	619.7	349.0	0.6812	1.3285
267	53.99	0.001178	0.03329	271.9	619.6	347.7	0.6833	1.3270
268	54.85	0.001181	0.03272	273.0	619.4	346.4	0.6854	1.3255
269	55.73	0.001184	0.03216	274.2	619.3	345.1	0.6875	1.3240
270	56.62	0.001186	0.03162	275.4	619.2	343.8	0.6896	1.3225
271	57.52	0.001189	0.03108	276.6	619.0	342.4	0.6918	1.3210
272	58.43	0.001192	0.03055	277.8	618.8	341.0	0.6939	1.3195
273	59.35	0.001195	0.03003	279.0	618.7	339.7	0.6960	1.3180
274	60.28	0.001198	0.02953	280.2	618.5	338.3	0.6981	1.3164
275	61.22	0.001200	0.02903	281.4	618.3	336.9	0.7003	1.3148
276	62.18	0.001203	0.02853	282.6	618.1	335.5	0.7024	1.3133
277	63.15	0.001206	0.02805	283.8	617.9	334.1	0.7045	1.3118
278	64.13	0.001209	0.02758	285.0	617.7	332.7	0.7066	1.3103
279	65.12	0.001212	0.02712	286.2	617.5	331.3	0.7087	1.3087
280	66.11	0.001214	0.02667	287.4	617.3	329.9	0.7108	1.3071
281	67.12	0.001217	0.02622	288.6	617.0	328.4	0.7129	1.3055
282	68.15	0.001220	0.02578	289.8	616.8	327.0	0.7150	1.3040
283	69.18	0.001223	0.02534	291.1	616.6	325.5	0.7171	1.3024
284	70.23	0.001226	0.02492	292.3	616.3	324.0	0.7193	1.3008
285	71.29	0.001229	0.02450	293.6	616.0	322.4	0.7214	1.2992
286	72.36	0.001232	0.02409	294.8	615.8	321.0	0.7235	1.2976
287	73.44	0.001235	0.02369	296.0	615.5	319.5	0.7257	1.2960
288	74.54	0.001238	0.02329	297.3	615.2	317.9	0.7279	1.2944
289	75.65	0.001240	0.02290	298.5	614.8	316.3	0.7300	1.2928
290	76.77	0.001244	0.02253	299.7	614.5	314.8	0.7321	1.2912
291	77.90	0.001247	0.02216	301.0	614.2	313.2	0.7343	1.2895
292	79.04	0.001250	0.02179	302.2	613.9	311.7	0.7364	1.2879
293	80.20	0.001253	0.02143	303.5	613.6	310.1	0.7385	1.2862
294	81.38	0.001256	0.02107	304.7	613.2	308.5	0.7406	1.2845
295	82.56	0.001259	0.02072	306.0	612.9	306.9	0.7427	1.2829
296	83.76	0.001262	0.02038	307.2	612.5	305.3	0.7449	1.2812
297	84.97	0.001266	0.02004	308.5	612.1	303.6	0.7471	1.2795
298	86.20	0.001269	0.01971	309.8	611.7	301.9	0.7493	1.2778
299	87.43	0.001272	0.01938	311.1	611.3	300.2	0.7514	1.2761
300	88.68	0.001276	0.01906	312.3	610.8	298.5	0.7535	1.2744
301	89.95	0.001280	0.01874	313.6	610.4	296.8	0.7557	1.2726
302	91.23	0.001283	0.01842	314.9	610.0	295.1	0.7578	1.2709
303	92.53	0.001287	0.01811	316.3	609.6	293.4	0.7600	1.2692

t	p	v'	v''	i'	i''	r	s'	s''
304	93.84	0.001290	0.01781	317.5	609.1	291.6	0.7622	1.2674
305	95.16	0.001294	0.01751	318.8	608.6	289.8	0.7644	1.2656
306	96.49	0.001298	0.01721	320.1	608.1	288.0	0.7665	1.2638
307	97.84	0.001302	0.01692	321.4	607.6	286.2	0.7687	1.2620
308	99.21	0.001306	0.01663	322.7	607.1	284.4	0.7700	1.2602
309	100.59	0.001310	0.01635	324.0	606.6	282.6	0.7730	1.2584
310	101.98	0.001314	0.01607	325.3	606.0	280.7	0.7752	1.2566
311	103.39	0.001319	0.01579	326.6	605.4	278.8	0.7774	1.2547
312	104.82	0.001324	0.01552	328.0	604.9	276.9	0.7796	1.2528
313	106.26	0.001328	0.01526	329.3	604.3	275.0	0.7817	1.2509
314	107.71	0.001333	0.01500	330.6	603.7	273.1	0.7839	1.2489
315	109.18	0.001338	0.01474	331.9	603.0	271.1	0.7861	1.2470
316	110.67	0.001343	0.01449	333.2	602.3	269.1	0.7883	1.2450
317	112.18	0.001348	0.01424	334.6	601.7	267.1	0.7905	1.2430
318	113.70	0.001353	0.01399	335.9	601.0	265.1	0.7927	1.2410
319	115.24	0.001358	0.01375	337.3	600.3	263.0	0.7949	1.2390
320	116.79	0.001364	0.01351	338.7	599.6	260.9	0.7971	1.2370
321	118.35	0.001369	0.01327	340.0	598.9	258.9	0.7993	1.2350
322	119.94	0.001375	0.01303	341.3	598.1	256.8	0.8015	1.2330
323	121.54	0.001381	0.01280	342.7	597.3	254.6	0.8037	1.2309
324	123.16	0.001386	0.01257	344.1	596.5	252.4	0.8059	1.2287
325	124.79	0.001392	0.01235	345.5	595.7	250.2	0.8082	1.2265
326	126.44	0.001398	0.01213	346.9	594.9	248.0	0.8104	1.2243
327	128.11	0.001404	0.01191	348.3	594.0	245.7	0.8126	1.2221
328	129.80	0.001411	0.01170	349.7	593.2	243.5	0.8149	1.2199
329	131.50	0.001417	0.01149	351.2	592.3	241.1	0.8172	1.2176
330	133.22	0.001424	0.01128	352.7	591.4	238.7	0.8195	1.2153
331	134.96	0.001430	0.01108	354.1	590.4	236.3	0.8217	1.2129
332	136.72	0.001437	0.01088	355.6	589.5	233.9	0.8240	1.2105
333	138.50	0.001444	0.01068	357.0	588.5	231.5	0.8263	1.2081
334	140.30	0.001452	0.01048	358.5	587.5	229.0	0.8286	1.2051
335	142.11	0.001459	0.01028	360.0	586.4	226.4	0.8309	1.2031
336	143.94	0.001466	0.01009	361.4	585.2	223.8	0.8332	1.2006
337	145.79	0.001474	0.009902	362.9	584.1	221.2	0.8355	1.1980
338	147.66	0.001482	0.009712	364.4	583.0	218.6	0.8377	1.1954
339	149.55	0.001490	0.009524	365.9	581.8	215.9	0.8400	1.1927
340	151.46	0.001498	0.009336	367.4	580.6	213.2	0.8423	1.1900
341	153.39	0.001507	0.009148	368.9	579.4	210.5	0.8446	1.1873
342	155.33	0.001515	0.008962	370.5	578.1	207.6	0.8470	1.1845
343	157.30	0.001524	0.008778	372.1	576.7	204.6	0.8494	1.1815
344	159.30	0.001533	0.008595	373.7	575.3	201.6	0.8518	1.1785
345	161.31	0.001543	0.008413	375.3	573.8	198.5	0.8543	1.1754
346	163.33	0.001553	0.008232	377.0	572.3	195.3	0.8569	1.1723
347	165.38	0.001563	0.008056	378.7	570.7	192.0	0.8595	1.1691
348	167.45	0.001574	0.007882	380.5	569.1	188.6	0.8622	1.1659
349	169.55	0.001585	0.007709	382.3	567.4	185.1	0.8650	1.1625
350	171.66	0.001596	0.007537	384.1	565.6	181.5	0.8678	1.1591
351	173.78	0.001608	0.007366	385.9	563.8	177.9	0.8706	1.1556
352	175.93	0.001620	0.007195	387.7	561.9	174.2	0.8734	1.1520
353	178.10	0.001632	0.007024	389.6	559.9	170.3	0.8764	1.1483
354	180.29	0.001646	0.006856	391.6	557.8	166.2	0.8795	1.1445
355	182.50	0.001660	0.006692	393.7	555.6	161.9	0.8828	1.1405
356	184.74	0.001676	0.006528	395.9	553.2	157.3	0.8863	1.1363
357	187.00	0.001692	0.006364	398.1	550.7	152.6	0.8898	1.1321
358	189.27	0.001710	0.006199	400.4	548.2	147.8	0.8935	1.1277

t	P	v'	v''	l'	l''	r	s'	s''
359	191.57	0.001729	0.006034	402.8	545.3	142.5	0.8976	1.1230
360	193.90	0.001750	0.005869	405.3	542.3	137.0	0.9018	1.1182
361	196.26	0.00177	0.00570	407.9	539.0	131.1	0.9062	1.1129
362	198.66	0.00180	0.00553	410.7	535.4	124.7	0.9110	1.1073
363	201.10	0.00183	0.00535	413.6	531.4	117.8	0.9162	1.1014
364	203.58	0.00186	0.00516	416.7	527.1	110.4	0.9218	1.0951
365	206.10	0.00189	0.00497	420.1	522.3	102.2	0.9280	1.0881
366	208.64	0.00193	0.00477	423.8	517.1	93.3	0.9347	1.0807
367	211.19	0.00198	0.00456	427.8	511.5	83.7	0.9420	1.0727
368	213.75	0.00203	0.00435	432.6	505.1	72.5	0.9504	1.0635
369	216.33	0.00210	0.00410	438.2	497.9	59.7	0.9601	1.0531
370	218.91	0.00222	0.00383	445.4	489.4	44.0	0.9720	1.0404
371	221.49	0.00251	0.00343	456.4	479.2	22.8	0.9922	1.0276

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PROPIEDADES TERMODINAMICAS DEL D₂O EN EL ESTADO DE SATURACION

P	t	v'	v''	l'	l''	r	s'	s''
0.010	9.276	0.0009042	119.5	5.5	556.8	551.3	0.0197	1.9717
0.015	15.212	0.0009043	81.33	11.4	559.2	547.8	0.0404	1.9401
0.020	19.601	0.0009047	61.91	15.8	560.9	545.1	0.0558	1.9177
0.025	23.109	0.0009051	50.16	19.3	562.4	543.1	0.0679	1.9010
0.030	26.050	0.0009056	42.22	22.2	563.5	541.3	0.0779	1.8868
0.035	28.599	0.0009060	36.48	24.8	564.5	539.7	0.0866	1.8749
0.040	30.85	0.0009065	32.14	27.0	565.4	538.4	0.0940	1.8647
0.045	32.86	0.0009070	28.73	29.1	566.2	537.1	0.1006	1.8558
0.050	34.69	0.0009074	26.01	30.9	566.9	536.0	0.1066	1.8475
0.055	36.38	0.0009079	23.77	32.6	567.5	534.9	0.1121	1.8406
0.060	37.92	0.0009084	21.90	34.1	568.1	534.0	0.1172	1.8337
0.065	39.36	0.0009088	20.31	35.6	568.7	533.1	0.1219	1.8277
0.070	40.73	0.0009093	18.94	36.9	569.2	532.3	0.1263	1.8220
0.075	41.99	0.0009097	17.74	38.2	569.7	531.5	0.1302	1.8168
0.080	43.19	0.0009101	16.69	39.4	570.2	530.8	0.1340	1.8120
0.085	44.34	0.0009105	15.76	40.5	570.6	530.1	0.1376	1.8073
0.090	45.41	0.0009109	14.93	41.6	571.0	529.4	0.1410	1.8031
0.095	46.45	0.0009113	14.19	42.6	571.4	528.8	0.1442	1.7989
0.10	47.42	0.0009117	13.52	43.6	571.8	528.2	0.1473	1.7951
0.11	49.28	0.0009124	12.36	45.5	572.6	527.1	0.1532	1.7876
0.12	50.98	0.0009131	11.39	47.2	573.2	526.0	0.1584	1.7811
0.13	52.56	0.0009137	10.56	48.7	573.8	525.1	0.1632	1.7750
0.14	54.05	0.0009144	9.849	50.1	574.4	524.3	0.1676	1.7696
0.15	55.46	0.0009150	9.233	51.6	575.0	523.4	0.1718	1.7645
0.16	56.79	0.0009156	8.688	52.9	575.5	522.6	0.1758	1.7597
0.17	58.04	0.0009162	8.206	54.1	576.0	521.9	0.1796	1.7553
0.18	59.23	0.0009167	7.777	55.3	576.5	521.2	0.1832	1.7510
0.19	60.37	0.0009172	7.392	56.5	577.0	520.5	0.1866	1.7471
0.20	61.46	0.0009177	7.044	57.6	577.4	519.8	0.1898	1.7433
0.21	62.51	0.0009182	6.728	58.6	577.8	519.2	0.1929	1.7398
0.22	63.52	0.0009187	6.440	59.6	578.2	518.6	0.1959	1.7364
0.23	64.48	0.0009192	6.176	60.6	578.6	518.0	0.1988	1.7330
0.24	65.40	0.0009196	5.934	61.5	579.0	517.5	0.2015	1.7298
0.25	66.29	0.0009201	5.712	62.4	579.3	516.9	0.2041	1.7267
0.26	67.16	0.0009205	5.505	63.3	579.6	516.3	0.2066	1.7239

p	t	v'	v''	l'	l''	r	s'	s''
0.27	68.01	0.0009210	5.314	64.1	580.9	516.8	0.2090	1.7212
0.28	68.82	0.0009214	5.136	64.9	580.2	515.3	0.2114	1.7185
0.29	69.60	0.0009218	4.970	65.7	580.5	514.8	0.2138	1.7159
0.30	70.38	0.0009222	4.815	66.4	580.8	514.4	0.2160	1.7133
0.32	71.84	0.0009230	4.531	67.9	581.4	513.5	0.2204	1.7087
0.34	73.23	0.0009237	4.281	69.3	581.9	512.6	0.2243	1.7043
0.36	74.56	0.0009244	4.058	70.7	582.4	511.7	0.2282	1.6999
0.38	75.83	0.0009250	3.857	71.9	582.9	511.0	0.2319	1.6959
0.40	77.04	0.0009257	3.676	73.1	583.3	510.2	0.2353	1.6921
0.45	79.85	0.0009273	3.292	75.9	584.3	508.4	0.2435	1.6834
0.50	82.42	0.0009288	2.983	78.5	585.2	506.7	0.2508	1.6755
0.55	84.79	0.0009303	2.728	80.9	586.0	505.1	0.2576	1.6688
0.60	86.98	0.0009317	2.515	83.1	586.8	503.7	0.2637	1.6624
0.65	89.00	0.0009330	2.332	85.1	587.5	502.4	0.2694	1.6567
0.70	90.91	0.0009342	2.175	87.0	588.2	501.2	0.2746	1.6513
0.75	92.72	0.0009354	2.039	88.8	588.8	500.0	0.2797	1.6463
0.80	94.42	0.0009365	1.919	90.5	589.4	498.9	0.2844	1.6417
0.85	96.04	0.0009376	1.813	92.1	590.0	497.9	0.2887	1.6375
0.90	97.57	0.0009386	1.719	93.6	590.6	497.0	0.2928	1.6333
0.95	99.05	0.0009396	1.634	95.1	591.2	496.1	0.2968	1.6295
1.0	100.45	0.0009406	1.558	96.5	591.7	495.2	0.3006	1.6258
1.1	103.11	0.0009425	1.425	99.3	592.6	493.3	0.3076	1.6189
1.2	105.56	0.0009443	1.314	101.8	593.4	491.6	0.3143	1.6125
1.3	107.85	0.0009460	1.220	104.0	594.2	490.2	0.3205	1.6068
1.4	110.01	0.0009476	1.138	106.2	594.9	489.7	0.3261	1.6017
1.5	112.04	0.0009492	1.066	108.2	595.6	487.4	0.3315	1.5965
1.6	113.96	0.0009507	1.004	110.2	596.2	486.0	0.3364	1.5918
1.7	115.78	0.0009522	0.9480	112.0	596.8	484.8	0.3412	1.5876
1.8	117.52	0.0009536	0.8986	113.8	597.4	483.6	0.3457	1.5836
1.9	119.18	0.0009550	0.8542	115.5	598.0	482.5	0.3500	1.5797
2.0	120.77	0.0009563	0.8140	117.1	598.5	481.4	0.3540	1.5759
2.1	122.30	0.0009576	0.7776	118.6	599.0	480.4	0.3580	1.5726
2.2	123.77	0.0009588	0.7444	120.1	599.4	479.3	0.3618	1.5693
2.3	125.19	0.0009600	0.7139	121.5	599.8	478.3	0.3654	1.5661
2.4	126.55	0.0009613	0.6860	122.9	600.3	477.4	0.3689	1.5632
2.5	127.87	0.0009625	0.6603	124.2	600.7	476.5	0.3722	1.5603
2.6	129.15	0.0009637	0.6364	125.5	601.1	475.6	0.3755	1.5576
2.7	130.39	0.0009647	0.6143	126.7	601.5	474.8	0.3786	1.5550
2.8	131.59	0.0009657	0.5938	127.9	601.9	474.0	0.3816	1.5524
2.9	132.76	0.0009668	0.5746	129.1	602.3	473.2	0.3845	1.5499
3.0	133.89	0.0009678	0.5566	130.3	602.6	472.3	0.3873	1.5475
3.1	135.00	0.0009688	0.5397	131.4	602.9	471.5	0.3900	1.5452
3.2	136.07	0.0009698	0.5238	132.5	603.2	470.7	0.3927	1.5430
3.3	137.13	0.0009708	0.5089	133.6	603.6	470.0	0.3952	1.5409
3.4	138.16	0.0009718	0.4948	134.6	603.9	469.3	0.3977	1.5388
3.5	139.15	0.0009728	0.4814	135.6	604.2	468.6	0.4001	1.5367
3.6	140.13	0.0009737	0.4689	136.6	604.5	467.9	0.4025	1.5347
3.7	141.09	0.0009746	0.4570	137.5	604.8	467.3	0.4048	1.5328
3.8	142.02	0.0009755	0.4456	138.4	605.1	466.7	0.4069	1.5310
3.9	142.93	0.0009764	0.4349	139.3	605.4	466.1	0.4090	1.5292
4.0	143.83	0.0009773	0.4247	140.2	605.6	465.4	0.4111	1.5274
4.1	144.71	0.0009782	0.4149	141.1	605.9	464.8	0.4132	1.5257
4.2	145.59	0.0009791	0.4055	142.0	606.2	464.2	0.4153	1.5240
4.3	146.43	0.0009799	0.3966	142.8	606.5	463.7	0.4173	1.5224
4.4	147.25	0.0009807	0.3882	143.6	606.8	463.2	0.4192	1.5208

p	t	v'	v''	l'	l''	r	s'	s''
4.5	148.06	0.0009815	0.3800	144.4	607.0	462.6	0.4211	1.5192
4.6	148.87	0.0009824	0.3722	145.2	607.2	462.0	0.4230	1.5176
4.7	149.65	0.0009832	0.3648	146.0	607.5	461.5	0.4248	1.5161
4.8	150.42	0.0009840	0.3577	146.8	607.8	461.0	0.4266	1.5146
4.9	151.18	0.0009848	0.3508	147.6	608.0	460.4	0.4284	1.5133
5.0	151.92	0.0009855	0.3442	148.3	608.2	459.9	0.4300	1.5118
5.2	153.39	0.0009871	0.3316	149.8	608.6	458.8	0.4335	1.5090
5.4	154.81	0.0009886	0.3201	151.2	609.0	457.8	0.4368	1.5063
5.6	156.19	0.0009900	0.3092	152.6	609.4	456.8	0.4400	1.5034
5.8	157.52	0.0009914	0.2991	154.0	609.8	455.8	0.4430	1.5013
6.0	158.82	0.0009928	0.2898	155.3	610.2	454.9	0.4460	1.4989
6.2	160.09	0.0009942	0.2809	156.6	610.5	453.9	0.4488	1.4965
6.4	161.33	0.0009956	0.2726	157.9	610.8	452.9	0.4516	1.4943
6.6	162.53	0.0009970	0.2648	159.1	611.1	452.0	0.4543	1.4921
6.8	163.70	0.0009983	0.2574	160.3	611.4	451.1	0.4570	1.4899
7.0	164.85	0.0009996	0.2505	161.5	611.7	450.2	0.4596	1.4878
7.2	165.98	0.0010009	0.2439	162.6	612.0	449.4	0.4622	1.4857
7.4	167.08	0.0010021	0.2376	163.7	612.3	448.6	0.4647	1.4838
7.6	168.14	0.0010033	0.2317	164.8	612.6	447.8	0.4672	1.4819
7.8	169.20	0.0010046	0.2261	165.9	612.9	447.0	0.4696	1.4801
8.0	170.23	0.0010058	0.2207	166.9	613.2	446.3	0.4720	1.4783
8.2	171.23	0.0010070	0.2155	167.9	613.4	445.5	0.4743	1.4766
8.4	172.23	0.0010082	0.2106	168.9	613.6	444.7	0.4765	1.4747
8.6	173.20	0.0010093	0.2059	169.9	613.8	443.9	0.4787	1.4730
8.8	174.15	0.0010105	0.2014	170.9	614.0	443.1	0.4809	1.4713
9.0	175.09	0.0010116	0.1972	171.9	614.2	442.3	0.4830	1.4696
9.2	176.01	0.0010127	0.1931	172.8	614.4	441.6	0.4851	1.4680
9.4	176.92	0.0010138	0.1892	173.8	614.5	440.7	0.4872	1.4664
9.6	177.81	0.0010149	0.1854	174.7	614.7	440.0	0.4892	1.4648
9.8	178.69	0.0010159	0.1818	175.7	614.8	439.1	0.4912	1.4633
10.0	179.54	0.0010170	0.1783	176.7	615.0	438.3	0.4932	1.4618
10.5	181.65	0.0010196	0.1702	178.7	615.3	436.6	0.4979	1.4582
11.0	183.66	0.0010221	0.1628	180.7	615.6	434.9	0.5024	1.4546
11.5	185.60	0.0010246	0.1561	182.7	615.9	433.2	0.5068	1.4512
12.0	187.49	0.0010270	0.1499	184.7	616.2	431.5	0.5111	1.4480
12.5	189.32	0.0010294	0.1443	186.5	616.5	430.0	0.5152	1.4449
13.0	191.09	0.0010318	0.1390	188.3	616.7	428.4	0.5192	1.4419
13.5	192.80	0.0010341	0.1340	190.1	617.0	426.9	0.5230	1.4391
14.0	194.46	0.0010363	0.1294	191.9	617.2	425.3	0.5268	1.4364
14.5	196.07	0.0010384	0.1251	193.6	617.4	423.8	0.5304	1.4337
15.0	197.67	0.0010406	0.1211	195.2	617.6	422.4	0.5340	1.4312
15.5	199.20	0.0010428	0.1172	196.8	617.8	421.0	0.5374	1.4287
16.0	200.69	0.0010449	0.1137	198.4	618.0	419.6	0.5408	1.4264
16.5	202.16	0.0010470	0.1104	199.9	618.2	418.3	0.5441	1.4241
17.0	203.59	0.0010490	0.1072	201.4	618.4	417.0	0.5472	1.4218
17.5	204.99	0.0010510	0.1042	202.8	618.5	415.7	0.5502	1.4196
18.0	206.35	0.0010530	0.1014	204.3	618.7	414.4	0.5532	1.4174
18.5	207.68	0.0010549	0.09869	205.7	618.8	413.1	0.5561	1.4153
19.0	208.97	0.0010568	0.09615	207.0	619.0	412.0	0.5589	1.4133
19.5	210.25	0.0010587	0.09373	208.3	619.2	410.9	0.5616	1.4114
20.0	211.50	0.0010606	0.09141	209.6	619.4	409.8	0.5643	1.4096
20.5	212.74	0.0010625	0.08912	211.0	619.5	408.5	0.5669	1.4076
21.0	213.96	0.0010644	0.08713	212.3	619.6	407.3	0.5697	1.4057
21.5	215.15	0.0010662	0.08512	213.6	619.8	406.2	0.5722	1.4039
22.0	216.30	0.0010680	0.08322	214.8	619.9	405.1	0.5747	1.4022

p	t	v'	v''	l'	l''	r	s'	s''
22.5	217.44	0.0010698	0.08138	216.0	620.0	404.0	0.5771	1.4005
23.0	218.57	0.0010716	0.07964	217.3	620.1	402.8	0.5795	1.3983
23.5	219.68	0.0010734	0.07795	218.5	620.2	401.7	0.5820	1.3971
24.0	220.76	0.0010752	0.07634	219.7	620.3	400.6	0.5844	1.3955
24.5	221.83	0.0010769	0.07478	220.8	620.4	399.6	0.5867	1.3939
25.0	222.89	0.0010787	0.07330	222.0	620.5	398.5	0.5890	1.3923
25.5	223.93	0.0010804	0.07188	223.1	620.6	397.5	0.5912	1.3907
26.0	224.95	0.0010822	0.07049	224.3	620.7	396.4	0.5934	1.3892
26.5	225.97	0.0010839	0.06916	225.4	620.8	395.4	0.5956	1.3877
27.0	226.96	0.0010856	0.06787	226.5	620.8	394.3	0.5978	1.3862
27.5	227.94	0.0010873	0.06664	227.5	620.9	393.4	0.5998	1.3848
28.0	228.90	0.0010890	0.06544	228.6	621.0	392.4	0.6018	1.3834
28.5	229.84	0.0010907	0.06429	229.6	621.0	391.4	0.6038	1.3820
29.0	230.79	0.0010924	0.06319	230.6	621.0	390.4	0.6059	1.3806
29.5	231.71	0.0010941	0.06212	231.7	621.1	389.4	0.6079	1.3792
30	232.62	0.0010958	0.06108	232.7	621.1	388.4	0.6099	1.3778
31	234.42	0.0010994	0.05910	234.7	621.2	386.5	0.6137	1.3751
32	236.18	0.0011028	0.05724	236.7	621.2	384.5	0.6177	1.3724
33	237.89	0.0011062	0.05548	238.6	621.2	382.6	0.6213	1.3700
34	239.56	0.0011096	0.05382	240.5	621.3	380.8	0.6248	1.3676
35	241.19	0.0011130	0.05227	242.2	621.3	379.1	0.6282	1.3652
36	242.79	0.0011164	0.05079	244.0	621.3	377.3	0.6316	1.3629
37	244.36	0.0011198	0.04939	245.8	621.3	375.5	0.6350	1.3607
38	245.89	0.0011232	0.04806	247.6	621.3	373.7	0.6384	1.3582
39	247.40	0.0011268	0.04680	249.3	621.2	371.9	0.6416	1.3561
40	248.87	0.0011302	0.04560	251.0	621.2	370.2	0.6447	1.3539
41	250.32	0.001134	0.04446	252.6	621.1	368.5	0.6478	1.3517
42	251.73	0.001138	0.04337	254.2	621.0	366.8	0.6508	1.3496
43	253.12	0.001141	0.04332	255.8	621.0	365.2	0.6538	1.3476
44	254.49	0.001144	0.04132	257.4	620.9	363.5	0.6567	1.3456
45	255.84	0.001148	0.04037	258.9	620.8	361.9	0.6596	1.3436
46	257.16	0.001152	0.03945	260.5	620.7	360.2	0.6624	1.3416
47	258.47	0.001155	0.03857	262.0	620.6	358.6	0.6652	1.3397
48	259.74	0.001158	0.03773	263.5	620.5	357.0	0.6679	1.3378
49	261.00	0.001162	0.03692	264.9	620.4	355.5	0.6705	1.3360
50	262.24	0.001165	0.03614	266.3	620.2	353.9	0.6731	1.3341
51	263.46	0.001168	0.03538	267.8	620.1	352.3	0.6758	1.3322
52	264.66	0.001172	0.03465	269.2	619.9	350.7	0.6784	1.3304
53	265.85	0.001175	0.03396	270.6	619.8	349.2	0.6809	1.3286
54	267.01	0.001178	0.03328	272.0	619.6	347.6	0.6834	1.3269
55	268.17	0.001181	0.03263	273.3	619.4	346.1	0.6858	1.3252
56	269.30	0.001184	0.03200	274.6	619.3	344.7	0.6882	1.3235
57	270.42	0.001188	0.03139	275.8	619.1	343.3	0.6905	1.3228
58	271.54	0.001191	0.03080	277.2	618.9	341.7	0.6929	1.3201
59	272.62	0.001194	0.03023	278.6	618.7	340.1	0.6953	1.3184
60	273.70	0.001197	0.02968	280.0	618.6	338.6	0.6976	1.3168
61	274.77	0.001200	0.02914	281.2	618.4	337.2	0.6998	1.3152
62	275.82	0.001203	0.02863	282.4	618.2	335.8	0.7020	1.3136
63	276.85	0.001206	0.02813	283.7	618.0	334.3	0.7042	1.3120
64	277.87	0.001209	0.02764	285.0	617.8	332.8	0.7064	1.3104
65	278.89	0.001212	0.02717	286.2	617.6	331.4	0.7086	1.3090
66	279.89	0.001214	0.02671	287.4	617.3	329.9	0.7107	1.3074
67	280.88	0.001217	0.02627	288.6	617.1	328.5	0.7128	1.3058

p	t	v'	v''	l'	l''	r	s'	s''
68	281.86	0.001220	0.02584	289.7	616.8	327.1	0.7148	1.3043
69	282.82	0.001222	0.02542	290.9	616.6	325.7	0.7168	1.3027
70	283.78	0.001225	0.02501	292.1	616.4	324.3	0.7189	1.3012
71	284.72	0.001228	0.02462	293.2	616.1	322.9	0.7209	1.2997
72	285.68	0.001231	0.02423	294.4	615.9	321.5	0.7229	1.2982
73	286.59	0.001234	0.02385	295.6	615.7	320.1	0.7249	1.2967
74	287.51	0.001236	0.02349	296.7	615.4	318.7	0.7268	1.2952
75	288.42	0.001239	0.02313	297.8	615.1	317.3	0.7287	1.2937
76	289.32	0.001242	0.02279	298.9	614.8	315.9	0.7306	1.2922
77	290.21	0.001244	0.02245	300.0	614.5	314.5	0.7325	1.2907
78	291.09	0.001247	0.02212	301.1	614.2	313.1	0.7344	1.2893
79	291.97	0.001250	0.02180	302.2	614.0	311.8	0.7363	1.2879
80	292.83	0.001252	0.02149	303.3	613.7	310.4	0.7382	1.2865
81	293.68	0.001255	0.02118	304.4	613.4	309.0	0.7400	1.2851
82	294.53	0.001258	0.02088	305.4	613.0	307.6	0.7418	1.2837
83	295.37	0.001260	0.02060	306.5	612.8	306.3	0.7436	1.2823
84	296.20	0.001263	0.02031	307.5	612.4	304.9	0.7454	1.2809
85	297.02	0.001266	0.02003	308.6	612.1	303.5	0.7472	1.2795
86	297.83	0.001268	0.01976	309.6	611.8	302.2	0.7490	1.2781
87	298.65	0.001271	0.01949	310.7	611.5	300.8	0.7507	1.2767
88	299.46	0.001274	0.01923	311.8	611.2	299.4	0.7524	1.2753
89	300.25	0.001276	0.01898	312.8	610.8	298.0	0.7542	1.2740
90	301.04	0.001280	0.01872	313.7	610.4	296.7	0.7559	1.2727
91	301.82	0.001282	0.01848	314.7	610.1	295.4	0.7575	1.2713
92	302.60	0.001285	0.01824	315.7	609.8	294.1	0.7591	1.2699
93	303.36	0.001288	0.01800	316.7	609.4	292.7	0.7608	1.2685
94	304.12	0.001291	0.01777	317.7	609.0	291.3	0.7625	1.2671
95	304.89	0.001294	0.01754	318.7	608.7	290.0	0.7641	1.2658
96	305.63	0.001297	0.01732	319.6	608.3	288.7	0.7657	1.2645
97	306.38	0.001300	0.01710	320.6	608.0	287.4	0.7673	1.2632
98	307.11	0.001303	0.01689	321.6	607.6	286.0	0.7689	1.2619
99	307.84	0.001306	0.01668	322.5	607.2	284.7	0.7705	1.2606
100	308.57	0.001309	0.01647	323.5	606.8	283.3	0.7721	1.2590
102	310.02	0.001314	0.01607	325.3	606.0	280.7	0.7752	1.2565
104	311.43	0.001321	0.01568	327.2	605.2	278.0	0.7782	1.2538
106	312.83	0.001328	0.01531	329.0	604.4	275.4	0.7812	1.2512
108	314.20	0.001334	0.01495	330.9	603.6	272.7	0.7842	1.2486
110	315.55	0.001340	0.01460	332.7	602.7	270.0	0.7872	1.2459
112	316.88	0.001347	0.01427	334.5	601.8	267.3	0.7902	1.2432
114	318.20	0.001354	0.01394	336.2	600.9	264.7	0.7931	1.2406
116	319.50	0.001361	0.01362	338.0	600.0	262.0	0.7960	1.2380
118	320.77	0.001368	0.01331	339.7	599.1	259.4	0.7988	1.2354
120	322.04	0.001375	0.01302	341.4	598.1	256.7	0.8016	1.2328
122	323.28	0.001382	0.01274	343.1	597.2	254.1	0.8043	1.2302
124	324.52	0.001390	0.01246	344.8	596.2	251.4	0.8070	1.2276
126	325.73	0.001397	0.01219	346.5	595.2	248.7	0.8097	1.2250
128	326.93	0.001405	0.01193	348.2	594.2	246.0	0.8124	1.2223
130	328.12	0.001412	0.01168	349.9	593.2	243.3	0.8151	1.2196
132	329.29	0.001419	0.01143	351.6	592.1	240.5	0.8179	1.2169
134	330.45	0.001426	0.01119	353.3	591.0	237.7	0.8206	1.2142
136	331.59	0.001434	0.01096	355.0	590.0	235.0	0.8231	1.2115
138	332.72	0.001442	0.01073	356.6	588.8	232.2	0.8256	1.2088

p	t	v'	v''	l'	l''	r	s'	s''
140	333.84	0.001450	0.01051	358.2	587.6	229.4	0.8281	1.2061
142	334.94	0.001458	0.01029	359.8	586.4	226.6	0.8306	1.2033
144	336.03	0.001466	0.01009	361.5	585.2	223.7	0.8332	1.2005
146	337.11	0.001475	0.009879	363.1	584.0	220.9	0.8357	1.1977
148	338.18	0.001483	0.009677	364.7	582.8	218.1	0.8382	1.1949
150	339.24	0.001492	0.009480	366.3	581.6	215.3	0.8406	1.1921
152	340.28	0.001500	0.009283	367.9	580.3	212.4	0.8430	1.1893
154	341.32	0.001509	0.009091	369.5	579.0	209.5	0.8454	1.1864
156	342.34	0.001518	0.008899	371.0	577.6	206.6	0.8479	1.1835
158	343.35	0.001527	0.008715	372.6	576.2	203.6	0.8503	1.1804
160	344.35	0.001536	0.008531	374.3	574.8	200.5	0.8528	1.1774
162	345.35	0.001546	0.008352	376.0	573.3	197.3	0.8553	1.1744
164	346.32	0.001556	0.008176	377.6	571.8	194.2	0.8578	1.1713
166	347.30	0.001566	0.008002	379.3	570.3	191.0	0.8604	1.1682
168	348.27	0.001576	0.007836	381.0	568.6	187.6	0.8630	1.1650
170	349.21	0.011586	0.007669	382.7	566.9	184.2	0.8656	1.1618
172	350.16	0.001597	0.007506	384.4	565.2	180.8	0.8682	1.1585
174	351.11	0.001608	0.007345	386.1	563.5	177.4	0.8709	1.1552
176	352.05	0.001620	0.007188	387.9	561.8	173.9	0.8736	1.1518
178	352.98	0.001632	0.007030	389.7	560.0	170.3	0.8764	1.1484
180	353.91	0.001645	0.006880	391.6	558.0	166.4	0.8793	1.1449
182	354.83	0.001658	0.006730	393.5	556.0	162.5	0.8823	1.1412
184	355.75	0.001672	0.006582	395.5	553.9	158.4	0.8854	1.1375
186	356.65	0.001686	0.006435	397.5	551.7	154.2	0.8886	1.1338
188	357.51	0.001701	0.006292	399.4	549.5	150.1	0.8918	1.1300
190	358.36	0.001716	0.006147	401.4	547.2	145.8	0.8957	1.1261
192	359.21	0.001733	0.006003	403.5	544.8	141.3	0.8985	1.1221
194	360.06	0.00175	0.005861	405.6	542.2	136.6	0.9020	1.1178
196	360.90	0.00177	0.00572	407.7	539.4	131.7	0.9057	1.1134
198	361.73	0.00179	0.00558	409.8	536.4	126.6	0.9096	1.1088
200	362.56	0.00181	0.00544	412.3	533.2	120.9	0.9138	1.1040
202	363.37	0.00183	0.00529	414.8	529.9	115.1	0.9183	1.0991
204	364.17	0.00186	0.00514	417.4	526.5	109.1	0.9230	1.0940
206	364.97	0.00189	0.00498	420.1	522.5	102.4	0.9279	1.0883
208	365.75	0.00192	0.00483	422.9	518.3	95.4	0.9332	1.0825
210	366.53	0.00195	0.00466	425.7	514.0	88.3	0.9388	1.0764
212	367.32	0.00199	0.00450	429.2	509.4	80.2	0.9446	1.0698
214	368.11	0.00204	0.00432	433.1	504.3	71.1	0.9515	1.0624
216	368.88	0.00209	0.00413	437.6	498.9	61.3	0.9589	1.0544
218	369.65	0.00217	0.00393	443.0	492.7	49.7	0.9677	1.0450
220	370.43	0.00230	0.00368	449.0	485.4	36.4	0.9778	1.0344
222	371.22	0.00262	0.00332	460.2	477.2	17.0	0.9925	1.0189

Temperatura crítica = 371,5 °C

Presión crítica = 222,75 atm

Volumen crítico = 2,955 cm³/g

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PROPIEDADES DEL VAPOR DE AGUA Y DEL AGUA SATURADA

Temp. °F.	Pres. Psia	Volumen, ft ³ /lbm			Entalpia, Btu/lbm.			Entropia, Btu/lbm °F			Temp. °F
		Agua vf	Evap. vfg	Vapor vg	Agua hf	Evap. hfg	Vapor hg	Agua sf	Evap. sfg	Vapor sg	
705.47	3208.2	0.05078	0.00060	0.05078	909.0	0.0	909.0	1.0612	0.0000	1.0612	705.47
705.0	3198.3	0.04427	0.01301	0.05739	873.0	61.4	934.4	1.0329	0.0527	1.0856	705.0
704.5	3187.8	0.01233	0.01822	0.06055	861.9	85.3	947.2	1.0234	0.0732	1.0967	704.5
704.0	3177.2	0.01108	0.02192	0.06300	851.2	102.0	953.2	1.0169	0.0876	1.1046	704.0
703.5	3166.8	0.01015	0.02489	0.06501	848.2	115.2	963.5	1.0118	0.0991	1.1109	703.5
703.0	3156.3	0.03910	0.02744	0.06684	813.2	126.4	939.6	1.0076	0.1087	1.1163	703.0
702.5	3145.9	0.03878	0.02969	0.06847	838.9	136.1	974.9	1.0039	0.1171	1.1210	702.5
702.0	3135.5	0.03824	0.03173	0.06997	855.0	144.7	999.7	1.0006	0.1246	1.1252	702.0
701.5	3125.2	0.03777	0.03361	0.07138	831.5	152.6	984.0	0.9977	0.1314	1.1291	701.5
701.0	3114.9	0.03735	0.03536	0.07271	828.2	159.8	988.0	0.9949	0.1377	1.1326	701.0
700.5	3104.6	0.03697	0.03701	0.07397	825.2	166.5	991.7	0.9924	0.1435	1.1359	700.5
700.0	3094.3	0.03662	0.03857	0.07519	822.4	172.7	995.2	0.9901	0.1490	1.1390	700.0
699.0	3073.9	0.03600	0.04149	0.07749	817.3	184.2	1001.5	0.9858	0.1590	1.1447	699.0
698.0	3053.6	0.03546	0.04420	0.07966	812.6	194.5	1007.2	0.9818	0.1681	1.1499	698.0
697.0	3033.5	0.03498	0.04674	0.08172	808.4	204.0	1012.4	0.9783	0.1764	1.1547	697.0
696.0	3013.4	0.03455	0.04916	0.08371	804.4	212.8	1017.2	0.9749	0.1841	1.1591	696.0
695.0	2993.5	0.03415	0.05147	0.08563	800.6	221.0	1021.7	0.9718	0.1914	1.1632	695.0
694.0	2973.7	0.03379	0.05370	0.08749	797.1	228.5	1025.9	0.9689	0.1983	1.1671	694.0
693.0	2954.0	0.03345	0.05587	0.08931	793.8	236.1	1029.9	0.9660	0.2048	1.1708	693.0
692.0	2934.5	0.03313	0.05797	0.09110	790.5	243.1	1033.6	0.9634	0.2110	1.1744	692.0
690.0	2895.7	0.03256	0.06203	0.09459	784.5	256.1	1040.6	0.9583	0.2227	1.1810	690.0
688.0	2857.4	0.03201	0.06595	0.09799	778.8	268.2	1047.0	0.9535	0.2337	1.1872	688.0
686.0	2819.5	0.03157	0.06976	0.10133	773.4	279.5	1052.9	0.9490	0.2439	1.1930	686.0
684.0	2782.1	0.03114	0.07349	0.10463	768.2	290.2	1058.4	0.9447	0.2537	1.1984	684.0
682.0	2745.1	0.03071	0.07716	0.10790	763.3	300.4	1063.6	0.9406	0.2631	1.2036	682.0
680.0	2708.6	0.03037	0.08050	0.11117	758.5	310.1	1068.5	0.9365	0.2720	1.2086	680.0
678.0	2672.5	0.03002	0.08440	0.11442	753.8	319.4	1073.2	0.9326	0.2807	1.2133	678.0
676.0	2636.8	0.02970	0.08799	0.11769	749.2	328.5	1077.6	0.9287	0.2892	1.2179	676.0
674.0	2601.5	0.02939	0.09156	0.12096	744.7	337.2	1081.9	0.9249	0.2974	1.2223	674.0
672.0	2566.6	0.02911	0.09514	0.12424	740.2	345.7	1085.9	0.9212	0.3054	1.2266	672.0
670.0	2532.2	0.02884	0.09871	0.12755	735.8	354.0	1089.8	0.9174	0.3133	1.2307	670.0
668.0	2498.1	0.02858	0.10229	0.13087	731.5	362.1	1093.5	0.9137	0.3210	1.2347	668.0
666.0	2464.4	0.02834	0.10586	0.13421	727.1	370.0	1097.1	0.9100	0.3286	1.2387	666.0
664.0	2431.1	0.02811	0.10947	0.13757	722.9	377.7	1100.6	0.9064	0.3361	1.2425	664.0
662.0	2398.2	0.02789	0.11306	0.14095	718.8	385.1	1103.9	0.9028	0.3434	1.2462	662.0
660.0	2365.7	0.02768	0.11663	0.14431	714.9	392.1	1107.0	0.8995	0.3502	1.2498	660.0
658.0	2333.5	0.02748	0.12023	0.14771	711.1	399.0	1110.1	0.8963	0.3570	1.2533	658.0
656.0	2301.7	0.02725	0.12387	0.15115	707.4	405.7	1113.1	0.8931	0.3637	1.2567	656.0
654.0	2270.3	0.02709	0.12754	0.15463	703.7	412.2	1115.9	0.8899	0.3702	1.2601	654.0
652.0	2239.2	0.02691	0.13124	0.15816	700.0	418.7	1118.7	0.8868	0.3767	1.2634	652.0
650.0	2208.4	0.02674	0.13499	0.16173	696.4	425.0	1121.4	0.8837	0.3830	1.2667	650.0
648.0	2178.1	0.02657	0.13876	0.16531	692.9	431.1	1124.0	0.8806	0.3893	1.2699	648.0
646.0	2148.0	0.02641	0.14258	0.16890	689.4	437.2	1126.6	0.8776	0.3954	1.2730	646.0
644.0	2118.3	0.02625	0.14644	0.17269	685.9	443.1	1129.0	0.8746	0.4015	1.2761	644.0
642.0	2088.9	0.02610	0.15033	0.17643	682.5	448.9	1131.4	0.8716	0.4075	1.2791	642.0
640.0	2059.9	0.02595	0.15427	0.18021	679.1	454.6	1133.7	0.8686	0.4134	1.2821	640.0
638.0	2031.2	0.02580	0.15824	0.18405	675.8	460.2	1136.0	0.8657	0.4193	1.2850	638.0
636.0	2002.8	0.02566	0.16226	0.18792	672.4	465.7	1138.1	0.8628	0.4251	1.2879	636.0
634.0	1974.7	0.02553	0.16633	0.19185	669.1	471.1	1140.2	0.8599	0.4307	1.2907	634.0
632.0	1947.0	0.02539	0.17044	0.19583	665.9	476.4	1142.2	0.8571	0.4364	1.2934	632.0
630.0	1919.5	0.02526	0.17459	0.19986	662.7	481.6	1144.2	0.8542	0.4419	1.2962	630.0
628.0	1892.4	0.02514	0.17880	0.20394	659.5	486.7	1146.1	0.8514	0.4474	1.2988	628.0
626.0	1865.6	0.02501	0.18306	0.20807	656.3	491.7	1148.0	0.8486	0.4529	1.3015	626.0
624.0	1839.0	0.02489	0.18737	0.21223	653.1	496.6	1149.8	0.8458	0.4583	1.3041	624.0
622.0	1812.8	0.02477	0.19173	0.21650	650.0	501.5	1151.5	0.8430	0.4636	1.3066	622.0
620.0	1786.9	0.02465	0.19615	0.22081	646.9	506.3	1153.2	0.8403	0.4689	1.3092	620.0
618.0	1761.2	0.02455	0.20063	0.22517	643.8	511.0	1154.8	0.8375	0.4742	1.3117	618.0
616.0	1735.9	0.02444	0.20516	0.22960	640.8	515.6	1156.4	0.8348	0.4794	1.3141	616.0
614.0	1710.8	0.02433	0.20976	0.23409	637.8	520.2	1158.0	0.8321	0.4845	1.3166	614.0
612.0	1686.1	0.02422	0.21442	0.23865	634.8	524.7	1159.5	0.8294	0.4896	1.3190	612.0
610.0	1661.6	0.02412	0.21915	0.24327	631.8	529.2	1160.9	0.8267	0.4947	1.3214	610.0
608.0	1637.3	0.02402	0.22394	0.24796	628.8	533.6	1162.4	0.8240	0.4997	1.3238	608.0
606.0	1613.4	0.02392	0.22881	0.25273	625.9	537.9	1163.8	0.8214	0.5048	1.3261	606.0
604.0	1589.7	0.02382	0.23374	0.25757	622.9	542.2	1165.1	0.8187	0.5097	1.3284	604.0
602.0	1566.3	0.02373	0.23875	0.26248	620.0	546.4	1166.4	0.8161	0.5147	1.3307	602.0
600.0	1543.2	0.02364	0.24384	0.26747	617.1	550.6	1167.7	0.8134	0.5196	1.3330	600.0
598.0	1520.4	0.02354	0.24900	0.27255	614.3	554.7	1169.0	0.8108	0.5245	1.3353	598.0
596.0	1497.8	0.02345	0.25425	0.27770	611.4	558.8	1170.2	0.8082	0.5293	1.3375	596.0
594.0	1475.4	0.02337	0.25958	0.28294	608.6	562.8	1171.4	0.8056	0.5342	1.3398	594.0
592.0	1453.3	0.02328	0.26499	0.28827	605.7	566.8	1172.6	0.8030	0.5390	1.3420	592.0
590.0	1431.5	0.02319	0.27049	0.29368	602.9	570.8	1173.7	0.8004	0.5437	1.3442	590.0
588.0	1410.0	0.02311	0.27605	0.29919	600.1	574.7	1174.8	0.7978	0.5485	1.3464	588.0
586.0	1388.6	0.02303	0.28176	0.30478	597.3	578.5	1175.9	0.7953	0.5532	1.3485	586.0
584.0	1367.6	0.02295	0.28753	0.31048	594.6	582.4	1176.9	0.7927	0.5580	1.3507	584.0
582.0	1346.7	0.02287	0.29340	0.31627	591.8	586.1	1178.0	0.7902	0.5627	1.3528	582.0
580.0	1326.2	0.02279	0.29937	0.32216	589.1	589.9	1179.0	0.7876	0.5673	1.3550	580.0

Temp. °F.	Pres. Psia	Volumen, ft ³ /lbm			Entalpia, Btu/lbm.			Entropia, Btu/lbm XF			Temp. °F
		Agua vf	Evap. vfg	Vapor vg	Agua hf	Evap. hfg	Vapor hg	Agua sf	Evap. sfg	Vapor sg	
580.0	1326.17	0.02279	0.29937	0.32216	589.1	589.9	1179.0	0.7876	0.5973	1.3550	580.0
578.0	1303.84	0.02271	0.30544	0.32186	589.4	593.6	1179.9	0.7851	0.5720	1.3571	578.0
576.0	1283.74	0.02264	0.31162	0.33126	589.7	597.2	1180.9	0.7825	0.5766	1.3592	576.0
574.0	1265.89	0.02256	0.31790	0.34046	589.9	600.9	1181.8	0.7800	0.5813	1.3613	574.0
572.0	1246.26	0.02249	0.32429	0.34678	589.3	604.5	1182.7	0.7775	0.5859	1.3634	572.0
570.0	1226.83	0.02242	0.33079	0.35321	575.6	608.0	1183.6	0.7750	0.5905	1.3654	570.0
568.0	1207.72	0.02235	0.33741	0.35975	572.9	611.5	1184.5	0.7725	0.5950	1.3675	568.0
566.0	1188.80	0.02228	0.34414	0.36642	570.3	615.0	1185.3	0.7699	0.5996	1.3696	566.0
564.0	1170.10	0.02221	0.35099	0.37320	567.6	618.5	1186.1	0.7674	0.6041	1.3716	564.0
562.0	1151.63	0.02214	0.35797	0.38011	565.0	621.9	1186.9	0.7650	0.6087	1.3736	562.0
560.0	1133.38	0.02207	0.36507	0.38714	562.4	625.3	1187.7	0.7625	0.6132	1.3757	560.0
558.0	1115.36	0.02201	0.37230	0.39431	559.8	628.6	1188.4	0.7600	0.6177	1.3777	558.0
556.0	1097.55	0.02194	0.37966	0.40160	557.2	632.0	1189.2	0.7575	0.6222	1.3797	556.0
554.0	1079.96	0.02188	0.38715	0.40903	554.6	635.3	1189.9	0.7550	0.6267	1.3817	554.0
552.0	1062.50	0.02182	0.39479	0.41660	552.0	638.5	1190.6	0.7525	0.6311	1.3837	552.0
550.0	1045.43	0.02176	0.40256	0.42432	549.5	641.8	1191.2	0.7501	0.6356	1.3856	550.0
548.0	1028.49	0.02169	0.41048	0.43217	546.9	645.0	1191.9	0.7476	0.6400	1.3876	548.0
546.0	1011.75	0.02163	0.41855	0.44018	544.4	648.1	1192.5	0.7451	0.6445	1.3896	546.0
544.0	995.22	0.02157	0.42677	0.44834	541.8	651.3	1193.1	0.7427	0.6489	1.3915	544.0
542.0	978.90	0.02151	0.43514	0.45665	539.3	654.4	1193.7	0.7402	0.6533	1.3935	542.0
540.0	962.79	0.02146	0.44367	0.46513	536.8	657.5	1194.3	0.7378	0.6577	1.3954	540.0
538.0	946.88	0.02140	0.45237	0.47377	534.2	660.6	1194.8	0.7353	0.6621	1.3974	538.0
536.0	931.17	0.02134	0.46123	0.48257	531.7	663.6	1195.4	0.7329	0.6665	1.3993	536.0
534.0	915.66	0.02129	0.47026	0.49155	529.2	666.6	1195.9	0.7304	0.6708	1.4012	534.0
532.0	900.34	0.02123	0.47947	0.50070	526.8	669.6	1196.4	0.7280	0.6752	1.4032	532.0
530.0	885.23	0.02118	0.48886	0.51004	524.3	672.6	1196.9	0.7255	0.6796	1.4051	530.0
528.0	870.31	0.02112	0.49843	0.51955	521.8	675.5	1197.3	0.7231	0.6839	1.4070	528.0
526.0	855.58	0.02107	0.50819	0.52926	519.3	678.4	1197.8	0.7206	0.6883	1.4089	526.0
524.0	841.04	0.02102	0.51814	0.53916	516.9	681.3	1198.2	0.7182	0.6926	1.4108	524.0
522.0	826.69	0.02097	0.52829	0.54926	514.4	684.2	1198.6	0.7158	0.6969	1.4127	522.0
520.0	812.53	0.02091	0.53864	0.55956	512.0	687.0	1199.0	0.7133	0.7013	1.4146	520.0
518.0	798.55	0.02086	0.54920	0.57006	509.6	689.9	1199.4	0.7109	0.7056	1.4165	518.0
516.0	784.76	0.02081	0.55997	0.58079	507.1	692.7	1199.8	0.7085	0.7099	1.4183	516.0
514.0	771.15	0.02076	0.57096	0.59173	504.7	695.4	1200.2	0.7060	0.7142	1.4202	514.0
512.0	757.72	0.02072	0.58218	0.60289	502.3	698.2	1200.5	0.7036	0.7185	1.4221	512.0
510.0	744.47	0.02067	0.59362	0.61429	499.9	700.9	1200.8	0.7012	0.7228	1.4240	510.0
508.0	731.40	0.02062	0.60530	0.62592	497.5	703.7	1201.1	0.6987	0.7271	1.4258	508.0
506.0	718.50	0.02057	0.61722	0.63779	495.1	706.3	1201.4	0.6963	0.7314	1.4277	506.0
504.0	705.78	0.02053	0.62938	0.64991	492.7	709.0	1201.7	0.6939	0.7357	1.4296	504.0
502.0	693.23	0.02048	0.64180	0.66228	490.3	711.7	1202.0	0.6915	0.7400	1.4314	502.0
500.0	680.86	0.02043	0.65448	0.67492	487.9	714.3	1202.2	0.6890	0.7443	1.4333	500.0
498.0	668.65	0.02039	0.66743	0.68782	485.6	716.9	1202.5	0.6866	0.7485	1.4352	498.0
496.0	656.61	0.02034	0.68065	0.70100	483.2	719.5	1202.7	0.6842	0.7528	1.4370	496.0
494.0	644.73	0.02030	0.69415	0.71445	480.8	722.1	1202.9	0.6818	0.7571	1.4389	494.0
492.0	633.03	0.02025	0.70794	0.72820	478.5	724.6	1203.1	0.6793	0.7614	1.4407	492.0
490.0	621.48	0.02021	0.72203	0.74224	476.1	727.2	1203.3	0.6769	0.7657	1.4426	490.0
488.0	610.10	0.02017	0.73641	0.75658	473.8	729.7	1203.5	0.6745	0.7700	1.4444	488.0
486.0	598.87	0.02013	0.75111	0.77124	471.5	732.2	1203.7	0.6721	0.7742	1.4463	486.0
484.0	587.81	0.02009	0.76613	0.78622	469.1	734.7	1203.8	0.6696	0.7785	1.4481	484.0
482.0	576.90	0.02004	0.78148	0.80152	466.8	737.2	1204.0	0.6672	0.7828	1.4500	482.0
480.0	566.15	0.02000	0.79716	0.81717	464.5	739.6	1204.1	0.6648	0.7871	1.4518	480.0
478.0	555.55	0.01996	0.81319	0.83315	462.2	742.1	1204.2	0.6624	0.7913	1.4537	478.0
476.0	545.11	0.01992	0.82958	0.84950	459.9	744.5	1204.3	0.6599	0.7956	1.4555	476.0
474.0	534.81	0.01988	0.84632	0.86621	457.5	746.9	1204.4	0.6575	0.7999	1.4574	474.0
472.0	524.67	0.01984	0.86345	0.88329	455.2	749.3	1204.5	0.6551	0.8042	1.4592	472.0
470.0	514.67	0.01980	0.88095	0.90076	452.9	751.6	1204.6	0.6527	0.8084	1.4611	470.0
468.0	504.83	0.01976	0.89885	0.91862	450.7	754.0	1204.6	0.6502	0.8127	1.4629	468.0
466.0	495.12	0.01973	0.91716	0.93689	448.4	756.3	1204.7	0.6478	0.8170	1.4648	466.0
464.0	485.56	0.01969	0.93588	0.95557	446.1	758.6	1204.7	0.6454	0.8213	1.4667	464.0
462.0	476.11	0.01965	0.95504	0.97469	443.8	761.0	1204.8	0.6429	0.8256	1.4685	462.0
460.0	466.87	0.01961	0.97463	0.99424	441.5	763.2	1204.8	0.6405	0.8299	1.4704	460.0
458.0	457.73	0.01958	0.99467	1.01425	439.3	765.5	1204.8	0.6381	0.8342	1.4722	458.0
456.0	448.73	0.01954	1.01518	1.03472	437.0	767.8	1204.8	0.6356	0.8385	1.4741	456.0
454.0	439.87	0.01950	1.03616	1.05567	434.7	770.0	1204.8	0.6332	0.8428	1.4759	454.0
452.0	431.14	0.01947	1.05764	1.07711	432.5	772.3	1204.8	0.6308	0.8471	1.4778	452.0
450.0	422.55	0.01943	1.07962	1.09905	430.2	774.5	1204.7	0.6283	0.8514	1.4797	450.0
448.0	414.09	0.01940	1.10212	1.12152	428.0	776.7	1204.7	0.6259	0.8557	1.4815	448.0
446.0	405.76	0.01936	1.12515	1.14452	425.7	778.9	1204.6	0.6234	0.8600	1.4834	446.0
444.0	397.56	0.01933	1.14874	1.16806	423.5	781.1	1204.6	0.6210	0.8643	1.4853	444.0
442.0	389.49	0.01929	1.17288	1.19217	421.3	783.2	1204.5	0.6185	0.8686	1.4872	442.0
440.0	381.54	0.01926	1.19761	1.21657	419.0	785.4	1204.4	0.6161	0.8729	1.4890	440.0
438.0	373.72	0.01923	1.22293	1.24216	416.8	787.5	1204.3	0.6136	0.8773	1.4909	438.0
436.0	366.03	0.01919	1.24887	1.26806	414.6	789.7	1204.2	0.6112	0.8816	1.4928	436.0
434.0	358.46	0.01916	1.27544	1.29450	412.4	791.8	1204.1	0.6087	0.8859	1.4947	434.0
432.0	351.00	0.01913	1.30266	1.32179	410.1	793.9	1204.0	0.6063	0.8903	1.4966	432.0
430.0	343.67	0.01909	1.33055	1.34965	407.9	796.0	1203.9	0.6038	0.8946	1.4985	430.0

Temp. °F.	Pres. Psia	Volumen, ft ³ /lbm			Entalpia, Btu/lbm.			Entropia, Btu/lbm Xf			Temp. °F
		Agua vf	Evap. vfg	Vapor vg	Agua hf	Evap. hfg	Vapor hg	Agua sf	Evap. sfg	Vapor sg	
430.0	343.674	0.01909	1.3306	1.3496	407.9	799.0	1203.9	0.6038	0.8916	1.4985	430.0
428.0	336.463	0.01906	1.3591	1.3782	405.7	798.0	1203.7	0.6014	0.8900	1.5004	428.0
426.0	329.360	0.01903	1.3884	1.4075	403.5	800.1	1203.6	0.5989	0.9034	1.5023	426.0
424.0	322.391	0.01900	1.4184	1.4374	401.3	802.2	1203.5	0.5964	0.9077	1.5042	424.0
422.0	315.529	0.01897	1.4492	1.4682	399.1	804.2	1203.3	0.5940	0.9121	1.5061	422.0
420.0	308.780	0.01894	1.4808	1.4997	396.9	806.2	1203.1	0.5915	0.9165	1.5080	420.0
418.0	302.143	0.01890	1.5131	1.5320	394.7	808.2	1202.9	0.5890	0.9209	1.5099	418.0
416.0	295.617	0.01887	1.5463	1.5651	392.5	810.2	1202.8	0.5866	0.9253	1.5118	416.0
414.0	289.201	0.01884	1.5803	1.5991	390.3	812.2	1202.6	0.5841	0.9297	1.5137	414.0
412.0	282.894	0.01881	1.6152	1.6340	388.1	814.2	1202.4	0.5816	0.9341	1.5157	412.0
410.0	276.694	0.01878	1.6510	1.6697	385.0	816.2	1202.1	0.5791	0.9385	1.5176	410.0
408.0	270.600	0.01875	1.6877	1.7084	382.8	818.2	1201.9	0.5766	0.9429	1.5195	408.0
406.0	264.611	0.01872	1.7253	1.7441	380.6	820.1	1201.7	0.5742	0.9473	1.5215	406.0
404.0	258.725	0.01870	1.7640	1.7827	378.4	822.0	1201.5	0.5717	0.9518	1.5234	404.0
402.0	252.942	0.01867	1.8037	1.8223	377.3	824.0	1201.2	0.5692	0.9562	1.5254	402.0
400.0	247.259	0.01864	1.8444	1.8630	375.1	825.9	1201.0	0.5667	0.9607	1.5274	400.0
398.0	241.677	0.01861	1.8862	1.9048	372.9	827.8	1200.7	0.5642	0.9651	1.5293	398.0
396.0	236.193	0.01858	1.9291	1.9477	370.8	829.7	1200.4	0.5617	0.9696	1.5313	396.0
394.0	230.807	0.01855	1.9731	1.9917	368.6	831.6	1200.2	0.5592	0.9741	1.5333	394.0
392.0	225.516	0.01853	2.0184	2.0369	366.5	833.4	1199.9	0.5567	0.9786	1.5352	392.0
390.0	220.321	0.01850	2.0649	2.0833	364.3	835.3	1199.6	0.5542	0.9831	1.5372	390.0
388.0	215.220	0.01847	2.1126	2.1311	362.2	837.2	1199.3	0.5516	0.9876	1.5392	388.0
386.0	210.211	0.01844	2.1616	2.1801	360.0	839.0	1199.0	0.5491	0.9921	1.5412	386.0
384.0	205.294	0.01842	2.2120	2.2304	357.9	840.8	1198.7	0.5466	0.9966	1.5432	384.0
382.0	200.467	0.01839	2.2638	2.2821	355.7	842.7	1198.4	0.5441	1.0012	1.5452	382.0
380.0	195.729	0.01836	2.3170	2.3353	353.6	844.5	1198.0	0.5416	1.0057	1.5473	380.0
378.0	191.080	0.01834	2.3716	2.3900	351.4	846.3	1197.7	0.5390	1.0103	1.5493	378.0
376.0	186.517	0.01831	2.4279	2.4462	349.3	848.1	1197.4	0.5365	1.0148	1.5513	376.0
374.0	182.040	0.01829	2.4857	2.5039	347.2	849.8	1197.0	0.5340	1.0194	1.5534	374.0
372.0	177.643	0.01826	2.5451	2.5633	345.0	851.6	1196.7	0.5314	1.0240	1.5554	372.0
370.0	173.339	0.01823	2.6062	2.6244	342.9	853.4	1196.3	0.5289	1.0286	1.5575	370.0
368.0	169.113	0.01821	2.6691	2.6873	340.8	855.1	1195.9	0.5263	1.0332	1.5595	368.0
366.0	164.968	0.01818	2.7337	2.7519	338.7	856.9	1195.6	0.5238	1.0378	1.5616	366.0
364.0	160.903	0.01816	2.8002	2.8184	336.5	858.6	1195.2	0.5212	1.0424	1.5637	364.0
362.0	156.917	0.01813	2.8687	2.8868	334.4	860.4	1194.8	0.5187	1.0471	1.5658	362.0
360.0	153.010	0.01811	2.9392	2.9573	332.3	862.1	1194.4	0.5161	1.0517	1.5678	360.0
358.0	149.173	0.01809	3.0117	3.0298	330.2	863.8	1194.0	0.5135	1.0564	1.5699	358.0
356.0	145.424	0.01806	3.0863	3.1044	328.1	865.5	1193.6	0.5110	1.0611	1.5721	356.0
354.0	141.744	0.01804	3.1632	3.1812	326.0	867.2	1193.2	0.5084	1.0658	1.5742	354.0
352.0	138.138	0.01801	3.2423	3.2603	323.9	868.9	1192.7	0.5058	1.0705	1.5763	352.0
350.0	134.601	0.01799	3.3238	3.3418	321.8	870.6	1192.3	0.5032	1.0752	1.5784	350.0
348.0	131.142	0.01797	3.4078	3.4258	319.7	872.2	1191.9	0.5006	1.0799	1.5806	348.0
346.0	127.751	0.01794	3.4943	3.5122	317.6	873.9	1191.4	0.4980	1.0847	1.5827	346.0
344.0	124.430	0.01792	3.5834	3.6013	315.5	875.5	1191.0	0.4954	1.0894	1.5849	344.0
342.0	121.177	0.01790	3.6752	3.6931	313.4	877.2	1190.5	0.4928	1.0942	1.5871	342.0
340.0	117.992	0.01787	3.7699	3.7878	311.3	878.8	1190.1	0.4902	1.0990	1.5892	340.0
338.0	114.873	0.01785	3.8675	3.8853	309.2	880.5	1189.6	0.4876	1.1038	1.5914	338.0
336.0	111.820	0.01783	3.9681	3.9859	307.1	882.1	1189.1	0.4850	1.1086	1.5936	336.0
334.0	108.832	0.01781	4.0718	4.0896	305.0	883.7	1188.7	0.4824	1.1134	1.5958	334.0
332.0	105.907	0.01779	4.1788	4.1966	302.9	885.3	1188.2	0.4798	1.1183	1.5981	332.0
330.0	103.045	0.01776	4.2892	4.3069	300.8	886.9	1187.7	0.4772	1.1231	1.6003	330.0
328.0	100.245	0.01774	4.4030	4.4208	298.7	888.5	1187.2	0.4745	1.1280	1.6025	328.0
326.0	97.506	0.01772	4.5205	4.5382	296.6	890.1	1186.7	0.4719	1.1329	1.6048	326.0
324.0	94.826	0.01770	4.6418	4.6595	294.6	891.6	1186.2	0.4692	1.1378	1.6071	324.0
322.0	92.203	0.01768	4.7669	4.7846	292.5	893.2	1185.7	0.4666	1.1427	1.6093	322.0
320.0	89.613	0.01766	4.8961	4.9138	290.4	894.8	1185.2	0.4640	1.1477	1.6116	320.0
318.0	87.137	0.01764	5.0295	5.0471	288.3	896.3	1184.7	0.4613	1.1526	1.6139	318.0
316.0	84.688	0.01761	5.1673	5.1849	286.3	897.9	1184.1	0.4586	1.1576	1.6162	316.0
314.0	82.263	0.01759	5.3096	5.3272	284.2	899.4	1183.6	0.4559	1.1626	1.6185	314.0
312.0	79.953	0.01757	5.4566	5.4742	282.1	901.0	1183.1	0.4533	1.1676	1.6209	312.0
310.0	77.667	0.01755	5.6085	5.6260	280.0	902.5	1182.5	0.4506	1.1726	1.6232	310.0
308.0	75.433	0.01753	5.7655	5.7830	278.0	904.0	1182.0	0.4479	1.1776	1.6256	308.0
306.0	73.251	0.01751	5.9277	5.9452	275.9	905.5	1181.4	0.4453	1.1827	1.6279	306.0
304.0	71.119	0.01749	6.0953	6.1130	273.8	907.0	1180.9	0.4426	1.1877	1.6303	304.0
302.0	69.038	0.01747	6.2689	6.2864	271.8	908.5	1180.3	0.4399	1.1928	1.6327	302.0
300.0	67.005	0.01745	6.4483	6.4658	269.7	910.0	1179.7	0.4372	1.1979	1.6351	300.0
298.0	65.021	0.01743	6.6339	6.6513	267.7	911.5	1179.2	0.4345	1.2031	1.6375	298.0
296.0	63.084	0.01741	6.8259	6.8433	265.6	913.0	1178.6	0.4317	1.2082	1.6400	296.0
294.0	61.194	0.01739	7.0245	7.0419	263.5	914.5	1178.0	0.4290	1.2134	1.6424	294.0
292.0	59.350	0.01738	7.2301	7.2475	261.5	915.9	1177.4	0.4263	1.2186	1.6449	292.0
290.0	57.550	0.01736	7.4430	7.4603	259.4	917.4	1176.8	0.4236	1.2238	1.6473	290.0
288.0	55.795	0.01734	7.6634	7.6807	257.4	918.8	1176.2	0.4208	1.2290	1.6498	288.0
286.0	54.083	0.01732	7.8916	7.9089	255.3	920.3	1175.6	0.4181	1.2342	1.6523	286.0
284.0	52.414	0.01730	8.1280	8.1453	253.3	921.7	1175.0	0.4154	1.2395	1.6548	284.0
282.0	50.786	0.01728	8.3729	8.3902	251.2	923.2	1174.4	0.4126	1.2448	1.6574	282.0
280.0	49.200	0.01726	8.6267	8.6439	249.2	924.6	1173.8	0.4098	1.2501	1.6599	280.0

Temp. °F.	Pres. Psia	Volumen, ft ³ /lbm			Entalpia, Btu/lbm			Entropia, Btu/lbm °F			Temp. °F
		Agua vf	Evap. vfg	Vapor vg	Agua hf	Evap. hfg	Vapor hg	Agua sf	Evap. sfg	Vapor sg	
280.0	49.200	0.017261	8.627	8.644	249.17	924.6	1173.8	0.1038	1.2501	1.6599	280.0
278.0	47.953	0.017246	8.890	8.607	247.13	924.0	1173.2	0.1071	1.2551	1.6625	278.0
276.0	46.117	0.017238	9.162	8.186	245.08	927.5	1172.5	0.1013	1.2607	1.6650	276.0
274.0	44.673	0.017210	9.445	9.462	243.03	928.9	1171.9	0.1015	1.2681	1.6676	274.0
272.0	43.249	0.017193	9.738	9.755	240.99	930.3	1171.3	0.3987	1.2715	1.6702	272.0
270.0	41.856	0.017175	10.012	10.060	238.95	931.7	1170.6	0.3960	1.2769	1.6729	270.0
268.0	40.500	0.017157	10.358	10.375	236.91	933.1	1170.0	0.3932	1.2823	1.6755	268.0
266.0	39.179	0.017140	10.685	10.703	234.87	934.5	1169.3	0.3904	1.2878	1.6781	266.0
264.0	37.894	0.017123	11.025	11.042	232.83	935.9	1168.7	0.3876	1.2933	1.6808	264.0
262.0	36.641	0.017106	11.378	11.395	230.79	937.2	1168.0	0.3847	1.2988	1.6835	262.0
260.0	35.427	0.017089	11.745	11.762	228.76	938.6	1167.4	0.3819	1.3043	1.6862	260.0
258.0	34.243	0.017072	12.125	12.142	226.72	940.0	1166.7	0.3791	1.3098	1.6889	258.0
256.0	33.091	0.017055	12.520	12.538	224.69	941.4	1166.1	0.3763	1.3154	1.6917	256.0
254.0	31.972	0.017039	12.931	12.948	222.65	942.7	1165.4	0.3734	1.3210	1.6944	254.0
252.0	30.853	0.017022	13.353	13.375	220.62	944.1	1164.7	0.3706	1.3266	1.6972	252.0
250.0	29.825	0.017005	13.802	13.819	218.59	945.4	1164.0	0.3677	1.3323	1.7000	250.0
248.0	28.795	0.016990	14.261	14.281	216.56	946.8	1163.4	0.3649	1.3379	1.7028	248.0
246.0	27.797	0.016974	14.744	14.761	214.53	948.1	1162.7	0.3620	1.3436	1.7056	246.0
244.0	26.826	0.016958	15.243	15.260	212.50	949.5	1162.0	0.3591	1.3494	1.7085	244.0
242.0	25.883	0.016942	15.763	15.780	210.48	950.8	1161.3	0.3562	1.3551	1.7113	242.0
240.0	24.968	0.016925	16.304	16.321	208.45	952.1	1160.6	0.3533	1.3609	1.7142	240.0
238.0	24.079	0.016910	16.867	16.884	206.42	953.5	1159.9	0.3505	1.3667	1.7171	238.0
236.0	23.216	0.016895	17.454	17.471	204.40	954.8	1159.2	0.3476	1.3725	1.7201	236.0
234.0	22.379	0.016880	18.065	18.082	202.38	956.1	1158.5	0.3446	1.3784	1.7230	234.0
232.0	21.567	0.016864	18.701	18.718	200.35	957.4	1157.8	0.3417	1.3842	1.7260	232.0
230.0	20.779	0.016849	19.364	19.381	198.33	958.7	1157.1	0.3388	1.3902	1.7290	230.0
228.0	20.014	0.016834	19.707	19.723	197.32	959.4	1156.4	0.3373	1.3931	1.7305	228.0
226.0	20.015	0.016821	20.056	20.073	196.31	960.0	1155.8	0.3359	1.3961	1.7320	226.0
224.0	19.642	0.016827	20.413	20.429	195.30	960.7	1155.0	0.3344	1.3991	1.7335	224.0
222.0	19.274	0.016812	20.777	20.794	194.29	961.3	1154.6	0.3329	1.4021	1.7350	222.0
220.0	18.912	0.016812	21.149	21.166	193.28	962.0	1153.3	0.3315	1.4051	1.7365	220.0
218.0	18.556	0.016805	21.529	21.545	192.27	962.6	1152.9	0.3300	1.4081	1.7380	218.0
216.0	18.206	0.016797	21.917	21.933	191.26	963.3	1151.5	0.3285	1.4111	1.7396	216.0
214.0	17.860	0.016790	22.313	22.330	190.25	963.9	1151.2	0.3270	1.4141	1.7411	214.0
212.0	17.521	0.016783	22.718	22.735	189.24	964.6	1150.8	0.3255	1.4171	1.7427	212.0
210.0	17.187	0.016775	23.131	23.148	188.23	965.2	1150.4	0.3241	1.4201	1.7442	210.0
208.0	16.857	0.016768	23.551	23.571	187.22	965.8	1150.1	0.3226	1.4232	1.7458	208.0
206.0	16.533	0.016761	23.986	24.002	186.21	966.5	1149.7	0.3211	1.4262	1.7473	206.0
204.0	16.214	0.016754	24.427	24.444	185.21	967.1	1149.3	0.3196	1.4293	1.7489	204.0
202.0	15.901	0.016747	24.878	24.894	184.20	967.8	1149.0	0.3181	1.4323	1.7505	202.0
200.0	15.592	0.016740	25.338	25.355	183.19	968.4	1148.6	0.3166	1.4354	1.7520	200.0
198.0	15.289	0.016732	25.809	25.826	182.18	969.0	1148.2	0.3151	1.4385	1.7536	198.0
196.0	14.990	0.016726	26.290	26.307	181.17	969.7	1147.8	0.3136	1.4416	1.7552	196.0
194.0	14.696	0.016719	26.782	26.799	180.17	970.3	1147.5	0.3121	1.4447	1.7568	194.0
192.0	14.407	0.016712	27.285	27.302	179.16	970.9	1147.1	0.3106	1.4478	1.7584	192.0
190.0	14.123	0.016705	27.799	27.816	178.15	971.6	1146.7	0.3091	1.4509	1.7600	190.0
188.0	13.843	0.016698	28.324	28.341	177.14	972.2	1146.4	0.3076	1.4540	1.7616	188.0
186.0	13.568	0.016691	28.862	28.878	176.14	972.8	1146.0	0.3061	1.4571	1.7632	186.0
184.0	13.297	0.016684	29.411	29.428	175.13	973.5	1145.6	0.3046	1.4602	1.7648	184.0
182.0	13.031	0.016677	29.973	29.989	174.12	974.1	1145.2	0.3031	1.4634	1.7665	182.0
180.0	12.770	0.016670	30.547	30.564	173.12	974.7	1144.9	0.3016	1.4665	1.7681	180.0
178.0	12.512	0.016664	31.135	31.151	172.11	975.4	1144.5	0.3001	1.4697	1.7698	178.0
176.0	12.259	0.016657	31.736	31.752	171.10	976.0	1144.1	0.2986	1.4728	1.7714	176.0
174.0	12.011	0.016650	32.350	32.367	170.10	976.6	1143.7	0.2971	1.4760	1.7731	174.0
172.0	11.766	0.016643	32.979	32.996	169.09	977.2	1143.3	0.2956	1.4792	1.7747	172.0
170.0	11.526	0.016637	33.622	33.639	168.09	977.9	1143.0	0.2940	1.4824	1.7764	170.0
168.0	11.290	0.016630	34.280	34.297	167.08	978.5	1142.6	0.2925	1.4856	1.7781	168.0
166.0	11.058	0.016624	34.951	34.970	166.08	979.1	1142.2	0.2910	1.4888	1.7798	166.0
164.0	10.830	0.016617	35.633	35.653	165.07	979.7	1141.8	0.2894	1.4920	1.7814	164.0
162.0	10.603	0.016611	36.348	36.364	164.06	980.4	1141.4	0.2879	1.4952	1.7831	162.0
160.0	10.385	0.016604	37.069	37.086	163.06	981.0	1141.0	0.2864	1.4985	1.7848	160.0
158.0	10.168	0.016598	37.808	37.824	162.05	981.6	1140.7	0.2848	1.5017	1.7865	158.0
156.0	9.956	0.016591	38.564	38.580	161.05	982.2	1140.3	0.2833	1.5050	1.7882	156.0
154.0	9.747	0.016585	39.337	39.354	160.05	982.8	1140.0	0.2818	1.5082	1.7900	154.0
152.0	9.541	0.016578	40.130	40.146	159.04	983.5	1139.6	0.2802	1.5115	1.7917	152.0
150.0	9.340	0.016572	40.941	40.957	158.04	984.1	1139.2	0.2787	1.5148	1.7934	150.0
148.0	9.141	0.016566	41.771	41.787	157.03	984.7	1138.9	0.2771	1.5180	1.7952	148.0
146.0	8.947	0.016559	42.621	42.638	156.03	985.3	1138.5	0.2756	1.5213	1.7969	146.0
144.0	8.756	0.016553	43.492	43.508	155.02	985.9	1138.2	0.2740	1.5246	1.7987	144.0
142.0	8.568	0.016547	44.383	44.400	154.02	986.5	1137.8	0.2725	1.5279	1.8004	142.0
140.0	8.384	0.016541	45.297	45.313	153.02	987.1	1137.5	0.2709	1.5313	1.8022	140.0
138.0	8.203	0.016534	46.232	46.249	152.01	987.7	1137.2	0.2694	1.5346	1.8040	138.0
136.0	8.025	0.016528	47.190	47.207	151.01	988.3	1136.9	0.2678	1.5379	1.8057	136.0
134.0	7.850	0.016522	48.172	48.189	150.01	989.0	1136.6	0.2662	1.5413	1.8075	134.0
132.0	7.679	0.016516	49.178	49.194	149.00	989.6	1136.3	0.2647	1.5446	1.8093	132.0
130.0	7.511	0.016510	50.208	50.225	148.00	990.2	1136.0	0.2631	1.5480	1.8111	130.0

Temp. °F.	Pres. Psia	Volumen, ft ³ /lbm			Entalpia, Btu/lbm.			Entropia, Btu/lbm XF			Temp. °F
		Agua vf	Evap. vfg	Vapor vg	Agua hf	Evap. hfg	Vapor hg	Agua sf	Evap. sfg	Vapor sg	
150.0	7.5110	0.016510	50.21	50.22	118.90	990.2	1188.2	0.2639	1.5180	1.8111	150.0
170.0	7.3160	0.016501	51.26	51.28	117.00	990.8	1137.8	0.2615	1.5211	1.8129	170.0
178.0	7.1810	0.016498	52.35	52.36	115.99	991.4	1137.4	0.2600	1.5248	1.8147	178.0
177.0	7.0250	0.016492	53.46	53.47	114.99	992.0	1137.0	0.2581	1.5282	1.8166	177.0
176.0	6.8690	0.016486	54.59	54.61	113.99	992.6	1136.6	0.2568	1.5316	1.8184	176.0
175.0	6.7150	0.016480	55.76	55.77	112.99	993.2	1136.2	0.2552	1.5350	1.8202	175.0
174.0	6.5656	0.016474	56.95	56.97	111.98	993.8	1135.8	0.2537	1.5384	1.8221	174.0
173.0	6.4182	0.016468	58.18	58.19	110.98	994.4	1135.4	0.2521	1.5418	1.8239	173.0
172.0	6.2736	0.016463	59.43	59.45	109.98	995.0	1135.0	0.2505	1.5453	1.8258	172.0
171.0	6.1318	0.016457	60.72	60.74	108.98	995.6	1134.6	0.2489	1.5487	1.8275	171.0
170.0	5.9926	0.016451	62.04	62.06	107.97	996.2	1134.2	0.2473	1.5522	1.8295	170.0
169.0	5.8562	0.016445	63.39	63.41	106.97	996.8	1133.8	0.2457	1.5557	1.8314	169.0
168.0	5.7223	0.016440	64.78	64.80	105.97	997.4	1133.4	0.2441	1.5592	1.8333	168.0
167.0	5.5911	0.016434	66.21	66.23	104.97	998.0	1133.0	0.2425	1.5626	1.8352	167.0
166.0	5.4623	0.016428	67.67	67.68	103.97	998.6	1132.6	0.2409	1.5661	1.8371	166.0
165.0	5.3361	0.016423	69.17	69.18	102.96	999.2	1132.2	0.2393	1.5697	1.8390	165.0
164.0	5.2124	0.016417	70.70	70.72	101.96	999.8	1131.8	0.2377	1.5732	1.8409	164.0
163.0	5.0911	0.016412	72.28	72.30	100.96	1000.4	1131.4	0.2361	1.5767	1.8428	163.0
162.0	4.9722	0.016406	73.90	73.92	99.99	1001.0	1131.0	0.2345	1.5803	1.8448	162.0
161.0	4.8556	0.016401	75.55	75.58	98.98	1001.6	1130.6	0.2329	1.5838	1.8467	161.0
160.0	4.7414	0.016395	77.27	77.29	97.96	1002.2	1130.2	0.2313	1.5874	1.8487	160.0
159.0	4.6294	0.016390	79.02	79.04	96.95	1002.8	1129.8	0.2297	1.5910	1.8506	159.0
158.0	4.5197	0.016384	80.82	80.83	95.93	1003.4	1129.4	0.2281	1.5945	1.8526	158.0
157.0	4.4122	0.016379	82.66	82.68	94.93	1004.0	1129.0	0.2264	1.5981	1.8546	157.0
156.0	4.3068	0.016374	84.56	84.57	93.93	1004.6	1128.6	0.2248	1.6018	1.8566	156.0
155.0	4.2036	0.016369	86.50	86.52	92.93	1005.2	1128.2	0.2232	1.6054	1.8586	155.0
154.0	4.1023	0.016363	88.50	88.52	91.93	1005.8	1127.7	0.2216	1.6090	1.8606	154.0
153.0	4.0033	0.016358	90.55	90.57	90.93	1006.4	1127.3	0.2199	1.6126	1.8626	153.0
152.0	3.9068	0.016353	92.66	92.68	89.93	1007.0	1126.9	0.2183	1.6163	1.8646	152.0
151.0	3.8114	0.016348	94.83	94.84	88.93	1007.6	1126.5	0.2167	1.6200	1.8666	151.0
150.0	3.7181	0.016343	97.05	97.07	87.93	1008.2	1126.1	0.2150	1.6236	1.8686	150.0
149.0	3.6273	0.016337	99.33	99.35	86.93	1008.7	1125.7	0.2134	1.6273	1.8707	149.0
148.0	3.5381	0.016332	101.68	101.70	85.93	1009.3	1125.3	0.2117	1.6310	1.8727	148.0
147.0	3.4508	0.016327	104.10	104.11	84.93	1009.9	1124.9	0.2101	1.6347	1.8748	147.0
146.0	3.3653	0.016322	106.58	106.59	83.93	1010.5	1124.5	0.2084	1.6384	1.8769	146.0
145.0	3.2816	0.016317	109.12	109.14	82.93	1011.1	1124.1	0.2068	1.6422	1.8789	145.0
144.0	3.1997	0.016312	111.71	111.72	81.93	1011.7	1123.6	0.2051	1.6459	1.8810	144.0
143.0	3.1195	0.016308	114.34	114.35	80.93	1012.3	1123.2	0.2035	1.6497	1.8831	143.0
142.0	3.0411	0.016303	117.01	117.02	79.93	1012.9	1122.8	0.2018	1.6534	1.8852	142.0
141.0	2.9643	0.016298	120.05	120.07	78.93	1013.4	1122.4	0.2001	1.6572	1.8873	141.0
140.0	2.8892	0.016293	122.98	123.00	77.93	1014.0	1122.0	0.1985	1.6610	1.8895	140.0
139.0	2.8157	0.016288	125.99	126.01	76.93	1014.6	1121.6	0.1968	1.6648	1.8916	139.0
138.0	2.7438	0.016284	129.09	129.11	75.93	1015.2	1121.1	0.1951	1.6686	1.8937	138.0
137.0	2.6735	0.016279	132.28	132.29	74.93	1015.8	1120.7	0.1934	1.6724	1.8958	137.0
136.0	2.6047	0.016274	135.55	135.57	73.93	1016.4	1120.3	0.1918	1.6763	1.8979	136.0
135.0	2.5375	0.016270	138.93	138.94	72.93	1016.9	1119.9	0.1901	1.6801	1.9002	135.0
134.0	2.4717	0.016265	142.40	142.41	71.93	1017.5	1119.5	0.1884	1.6840	1.9024	134.0
133.0	2.4074	0.016260	145.97	145.98	70.93	1018.1	1119.1	0.1867	1.6878	1.9046	133.0
132.0	2.3445	0.016256	149.61	149.62	69.93	1018.7	1118.6	0.1851	1.6917	1.9068	132.0
131.0	2.2830	0.016251	153.42	153.44	68.93	1019.3	1118.2	0.1834	1.6956	1.9090	131.0
130.0	2.2230	0.016247	157.32	157.33	67.96	1019.8	1117.8	0.1817	1.6995	1.9112	130.0
129.0	2.1642	0.016243	161.32	161.34	66.96	1020.4	1117.4	0.1800	1.7035	1.9134	129.0
128.0	2.1068	0.016238	165.45	165.47	65.96	1021.0	1117.0	0.1783	1.7074	1.9157	128.0
127.0	2.0507	0.016234	169.70	169.72	64.96	1021.6	1116.5	0.1766	1.7113	1.9179	127.0
126.0	1.9959	0.016229	174.08	174.09	63.96	1022.2	1116.1	0.1749	1.7153	1.9202	126.0
125.0	1.9424	0.016225	178.58	178.60	62.96	1022.7	1115.7	0.1732	1.7193	1.9224	125.0
124.0	1.8901	0.016221	183.23	183.24	61.96	1023.3	1115.3	0.1715	1.7233	1.9247	124.0
123.0	1.8390	0.016217	188.01	188.03	60.96	1023.9	1114.9	0.1697	1.7273	1.9270	123.0
122.0	1.7891	0.016213	192.94	192.95	59.96	1024.5	1114.4	0.1680	1.7313	1.9293	122.0
121.0	1.7403	0.016208	198.01	198.03	58.96	1025.0	1114.0	0.1663	1.7353	1.9316	121.0
120.0	1.6927	0.016204	203.25	203.26	57.97	1025.6	1113.6	0.1646	1.7393	1.9339	120.0
119.0	1.6463	0.016200	208.64	208.66	56.97	1026.2	1113.2	0.1629	1.7434	1.9362	119.0
118.0	1.6009	0.016196	214.20	214.21	55.97	1026.8	1112.7	0.1611	1.7474	1.9386	118.0
117.0	1.5566	0.016192	219.93	219.94	54.97	1027.3	1112.3	0.1594	1.7515	1.9409	117.0
116.0	1.5133	0.016188	225.84	225.85	53.97	1027.9	1111.9	0.1577	1.7556	1.9433	116.0
115.0	1.4711	0.016184	231.93	231.94	52.97	1028.5	1111.5	0.1559	1.7597	1.9457	115.0
114.0	1.4299	0.016180	238.21	238.22	51.97	1029.1	1111.0	0.1542	1.7638	1.9480	114.0
113.0	1.3898	0.016177	244.69	244.70	50.98	1029.6	1110.6	0.1525	1.7679	1.9503	113.0
112.0	1.3505	0.016173	251.37	251.38	49.98	1030.2	1110.2	0.1507	1.7720	1.9528	112.0
111.0	1.3123	0.016169	258.26	258.28	48.98	1030.8	1109.8	0.1490	1.7763	1.9552	111.0
110.0	1.2750	0.016165	265.37	265.39	47.98	1031.4	1109.3	0.1472	1.7805	1.9577	110.0
109.0	1.2385	0.016162	272.71	272.72	46.98	1031.9	1108.9	0.1455	1.7846	1.9601	109.0
108.0	1.2030	0.016158	280.28	280.30	45.98	1032.5	1108.5	0.1437	1.7888	1.9626	108.0
107.0	1.1684	0.016154	288.09	288.11	44.99	1033.1	1108.1	0.1419	1.7931	1.9650	107.0
106.0	1.1347	0.016151	296.16	296.18	43.99	1033.6	1107.6	0.1402	1.7973	1.9675	106.0
105.0	1.1017	0.016147	304.49	304.50	42.99	1034.2	1107.2	0.1384	1.8015	1.9700	105.0

Temp. °F.	Pres. Psia	Volumen, ft ³ /lbm			Entalpia, Btu/lbm.			Entropia, Btu/lbm XF			Temp. °F.
		Agua vf	Evap. vfg	Vapor vg	Agua hf	Evap. hfg	Vapor hg	Agua sf	Evap. sfg	Vapor sg	
103.0	1.10174	0.016147	301.5	301.5	72.999	1031.2	1157.2	0.1384	1.8315	1.9709	103.0
104.0	1.06965	0.016144	313.1	313.1	71.932	1021.8	1104.8	0.1386	1.8378	1.9725	104.0
105.0	1.03838	0.016140	322.0	322.0	70.963	1005.4	1069.3	0.1389	1.8401	1.9750	105.0
106.0	1.00789	0.016137	331.1	331.1	69.995	987.9	1035.9	0.1391	1.8444	1.9775	106.0
107.0	0.97818	0.016133	340.6	340.6	68.997	963.6	1005.5	0.1393	1.8487	1.9800	107.0
108.0	0.94924	0.016130	350.4	350.4	67.999	937.1	975.1	0.1395	1.8530	1.9825	108.0
99.0	0.92103	0.016127	360.5	360.5	67.001	907.6	941.6	0.1397	1.8573	1.9851	99.0
98.0	0.89356	0.016123	370.9	370.9	66.003	878.2	910.2	0.1399	1.8617	1.9876	98.0
97.0	0.86679	0.016120	381.7	381.7	65.005	848.8	880.8	0.1242	1.8660	1.9902	97.0
96.0	0.84072	0.016117	392.8	392.9	64.006	819.3	853.3	0.1224	1.8701	1.9928	96.0
95.0	0.81534	0.016114	404.4	404.4	63.008	790.9	827.9	0.1206	1.8748	1.9954	95.0
94.0	0.79065	0.016111	416.5	416.5	62.010	763.5	803.5	0.1188	1.8792	1.9980	94.0
93.0	0.76655	0.016108	428.6	428.6	61.012	737.1	780.1	0.1170	1.8837	2.0006	93.0
92.0	0.74313	0.016105	441.3	441.3	60.014	711.6	757.6	0.1152	1.8881	2.0033	92.0
91.0	0.72032	0.016102	454.5	454.5	59.016	687.2	735.2	0.1134	1.8926	2.0059	91.0
90.0	0.69813	0.016099	468.1	468.1	58.018	663.7	713.7	0.1115	1.8970	2.0086	90.0
89.0	0.67653	0.016096	482.2	482.2	57.020	641.3	693.3	0.1097	1.9015	2.0112	89.0
88.0	0.65551	0.016093	496.8	496.8	56.022	619.9	674.9	0.1079	1.9060	2.0139	88.0
87.0	0.63507	0.016090	511.9	511.9	55.024	599.5	657.5	0.1061	1.9105	2.0166	87.0
86.0	0.61518	0.016087	527.5	527.5	54.026	580.0	642.0	0.1043	1.9151	2.0193	86.0
85.0	0.59583	0.016085	543.6	543.6	53.027	561.6	625.6	0.1024	1.9196	2.0221	85.0
84.0	0.57702	0.016082	560.3	560.3	52.029	544.1	610.1	0.1006	1.9242	2.0248	84.0
83.0	0.55872	0.016079	577.6	577.6	51.031	527.7	595.7	0.0988	1.9288	2.0275	83.0
82.0	0.54093	0.016077	595.5	595.5	50.033	512.3	582.3	0.0969	1.9334	2.0303	82.0
81.0	0.52361	0.016074	614.1	614.1	49.035	497.8	569.8	0.0951	1.9380	2.0331	81.0
80.0	0.50683	0.016072	633.3	633.3	48.037	484.4	557.4	0.0932	1.9426	2.0359	80.0
79.0	0.49049	0.016070	653.2	653.2	47.038	472.0	546.0	0.0914	1.9472	2.0387	79.0
78.0	0.47461	0.016067	673.8	673.8	46.040	460.6	535.6	0.0895	1.9518	2.0415	78.0
77.0	0.45919	0.016065	695.2	695.2	45.042	450.1	526.1	0.0877	1.9564	2.0443	77.0
76.0	0.44420	0.016063	717.4	717.4	44.043	440.7	517.7	0.0858	1.9610	2.0472	76.0
75.0	0.42964	0.016060	740.3	740.3	43.045	432.2	509.2	0.0839	1.9656	2.0500	75.0
74.0	0.41550	0.016058	764.1	764.1	42.046	424.6	501.6	0.0821	1.9702	2.0528	74.0
73.0	0.40177	0.016056	788.8	788.8	41.048	417.2	494.8	0.0802	1.9748	2.0556	73.0
72.0	0.38844	0.016054	814.3	814.3	40.049	410.9	488.9	0.0783	1.9794	2.0587	72.0
71.0	0.37549	0.016052	840.8	840.8	39.050	405.5	483.5	0.0764	1.9840	2.0616	71.0
70.0	0.36292	0.016050	868.3	868.3	38.052	400.0	478.0	0.0745	1.9886	2.0645	70.0
69.0	0.35073	0.016048	896.9	896.9	37.052	395.6	473.6	0.0727	1.9932	2.0675	69.0
68.0	0.33886	0.016046	926.5	926.5	36.054	391.2	469.2	0.0708	1.9978	2.0704	68.0
67.0	0.32740	0.016044	957.2	957.2	35.055	387.7	465.7	0.0689	2.0024	2.0734	67.0
66.0	0.31626	0.016043	989.0	989.1	34.056	384.3	462.3	0.0670	2.0070	2.0764	66.0
65.0	0.30545	0.016041	1022.1	1022.1	33.057	380.9	458.9	0.0651	2.0116	2.0794	65.0
64.0	0.29497	0.016039	1056.5	1056.5	32.058	377.4	455.4	0.0632	2.0162	2.0824	64.0
63.0	0.28480	0.016038	1092.1	1092.1	31.058	374.0	452.0	0.0613	2.0208	2.0854	63.0
62.0	0.27494	0.016036	1129.2	1129.2	30.059	370.6	448.6	0.0594	2.0254	2.0885	62.0
61.0	0.26538	0.016035	1167.6	1167.6	29.059	367.1	445.1	0.0575	2.0301	2.0915	61.0
60.0	0.25611	0.016033	1207.6	1207.6	28.060	363.7	441.7	0.0555	2.0347	2.0946	60.0
59.0	0.24713	0.016032	1249.1	1249.1	27.060	360.2	438.2	0.0536	2.0393	2.0977	59.0
58.0	0.23843	0.016031	1292.2	1292.2	26.060	356.8	434.8	0.0516	2.0439	2.1008	58.0
57.0	0.23000	0.016029	1337.0	1337.0	25.060	353.4	431.4	0.0497	2.0485	2.1039	57.0
56.0	0.22183	0.016028	1383.6	1383.6	24.059	350.0	428.0	0.0478	2.0530	2.1070	56.0
55.0	0.21392	0.016027	1432.0	1432.0	23.059	346.5	424.5	0.0458	2.0576	2.1102	55.0
54.0	0.20625	0.016026	1482.4	1482.4	22.058	343.1	421.1	0.0439	2.0622	2.1134	54.0
53.0	0.19883	0.016025	1534.7	1534.7	21.058	339.6	417.6	0.0419	2.0668	2.1165	53.0
52.0	0.19165	0.016024	1589.2	1589.2	20.057	336.2	414.2	0.0400	2.0714	2.1197	52.0
51.0	0.18469	0.016023	1645.9	1645.9	19.056	332.7	410.7	0.0380	2.0760	2.1230	51.0
50.0	0.17796	0.016023	1704.8	1704.8	18.054	329.3	407.3	0.0361	2.0806	2.1262	50.0
49.0	0.17144	0.016022	1766.2	1766.2	17.053	325.9	403.9	0.0341	2.0852	2.1294	49.0
48.0	0.16514	0.016021	1830.0	1830.0	16.051	322.4	400.4	0.0321	2.0898	2.1327	48.0
47.0	0.15904	0.016021	1896.5	1896.5	15.049	319.0	396.9	0.0301	2.0944	2.1360	47.0
46.0	0.15314	0.016020	1965.7	1965.7	14.047	315.6	393.6	0.0282	2.0990	2.1393	46.0
45.0	0.14744	0.016020	2037.7	2037.7	13.044	312.1	390.1	0.0262	2.1036	2.1426	45.0
44.0	0.14192	0.016019	2112.8	2112.8	12.041	308.7	386.7	0.0242	2.1082	2.1459	44.0
43.0	0.13659	0.016019	2191.0	2191.0	11.038	305.3	383.3	0.0222	2.1127	2.1493	43.0
42.0	0.13143	0.016019	2272.4	2272.4	10.035	301.9	379.9	0.0202	2.1173	2.1527	42.0
41.0	0.12645	0.016019	2357.3	2357.3	9.031	298.4	376.4	0.0182	2.1218	2.1560	41.0
40.0	0.12163	0.016019	2445.8	2445.8	8.027	294.9	372.9	0.0162	2.1264	2.1594	40.0
39.0	0.11698	0.016019	2538.0	2538.0	7.023	291.5	369.5	0.0142	2.1310	2.1627	39.0
38.0	0.11249	0.016019	2634.1	2634.1	6.018	288.1	366.1	0.0122	2.1356	2.1663	38.0
37.0	0.10815	0.016019	2734.4	2734.4	5.013	284.7	362.7	0.0101	2.1402	2.1697	37.0
36.0	0.10395	0.016020	2839.0	2839.0	4.008	281.2	359.2	0.0081	2.1448	2.1732	36.0
35.0	0.09991	0.016020	2948.1	2948.1	3.002	277.8	355.8	0.0061	2.1494	2.1767	35.0
34.0	0.09600	0.016021	3061.9	3061.9	1.996	274.4	352.4	0.0041	2.1540	2.1802	34.0
33.0	0.09223	0.016021	3180.7	3180.7	0.989	271.0	349.0	0.0020	2.1586	2.1837	33.0
32.018	0.08865	0.016022	3302.4	3302.4	0.0003	267.5	345.5	0.0000	2.1632	2.1872	32.018
32.0	0.08859	0.016022	3394.7	3394.7	-0.0179	264.0	342.0	-0.0000	2.1678	2.1873	32.0

FUNCIONES TERMODINAMICAS DEL D₂O EN ESTADO DE GAS IDEAL

t	c_{p0}	i_0	s_0	t	c_{p0}	i_0	s_0
3.8	0.4053	554.75	2.0029	410	0.4800	733.70	2.3958
10	0.4062	557.22	2.0119	420	0.4821	738.51	2.4028
20	0.4078	561.28	2.0260	430	0.4841	743.35	2.4097
30	0.4098	565.37	2.0397	440	0.4862	748.20	2.4166
40	0.4109	569.47	2.0530	450	0.4882	753.07	2.4233
50	0.4124	573.59	2.0659	460	0.4903	757.96	2.4300
60	0.4140	577.72	2.0785	470	0.4923	762.87	2.4367
70	0.4157	581.87	2.0908	480	0.4944	767.81	2.4433
80	0.4173	586.08	2.1027	490	0.4964	772.76	2.4498
90	0.4189	590.22	2.1144	500	0.4984	777.73	2.4563
100	0.4206	594.42	2.1258	510	0.5005	782.73	2.4627
110	0.4223	598.63	2.1370	520	0.5025	787.75	2.4691
120	0.4240	602.86	2.1479	530	0.5045	792.78	2.4754
130	0.4257	607.11	2.1586	540	0.5065	797.83	2.4817
140	0.4275	611.37	2.1691	550	0.5085	802.90	2.4879
150	0.4292	615.66	2.1793	560	0.5105	807.99	2.4940
160	0.4310	619.96	2.1893	570	0.5125	813.10	2.5001
170	0.4328	624.28	2.1992	580	0.5145	818.23	2.5062
180	0.4347	628.61	2.2089	590	0.5164	823.39	2.5122
190	0.4365	632.97	2.2184	600	0.5183	828.56	2.5182
200	0.4384	637.35	2.2277	610	0.5203	833.75	2.5241
210	0.4402	641.74	2.2369	620	0.5222	838.96	2.5299
220	0.4421	646.15	2.2460	630	0.5241	844.19	2.5357
230	0.4440	650.58	2.2548	640	0.5260	849.44	2.5415
240	0.4459	655.03	2.2636	650	0.5279	854.71	2.5473
250	0.4478	659.50	2.2722	660	0.5297	859.99	2.5530
260	0.4498	663.99	2.2807	670	0.5315	865.30	2.5587
270	0.4518	668.50	2.2891	680	0.5333	870.63	2.5643
280	0.4537	673.02	2.2974	690	0.5351	875.97	2.5699
290	0.4557	677.57	2.3056	700	0.5369	881.33	2.5754
300	0.4577	682.14	2.3136	710	0.5387	886.71	2.5809
310	0.4597	686.72	2.3215	720	0.5404	892.10	2.5863
320	0.4617	691.33	2.3293	730	0.5421	897.51	2.5917
330	0.4637	695.96	2.3370	740	0.5438	902.93	2.5971
340	0.4657	700.60	2.3447	750	0.5454	908.38	2.6025
350	0.4677	705.27	2.3522	760	0.5470	913.84	2.6078
360	0.4697	709.96	2.3597	770	0.5485	919.32	2.6131
370	0.4718	714.67	2.3671	780	0.5502	924.81	2.6183
380	0.4739	719.39	2.3744	790	0.5518	930.32	2.6235
390	0.4759	724.15	2.3816	800	0.5534	935.84	2.6287
400	0.4780	728.92	2.3887				

Cp₀ = Calor específico a presión constante.

i = Entropía

s = Entalpía.

DETERMINACION EXPERIMENTAL DEL FACTOR DE SEPARACION DE MEZCLAS SOLIDIFICADAS DE AGUA PESADA Y LIVIANA.

$$\alpha = \frac{(D/H)_{\text{hielo}}}{(D/H)_{\text{agua}}} = 1,0211 \pm 0,0007$$

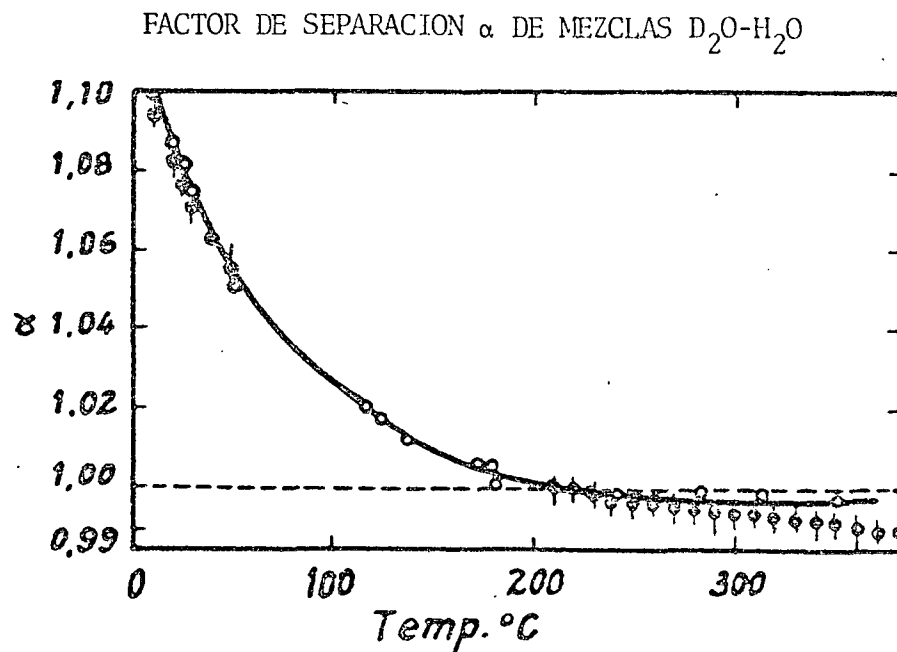
13-p.52

FACTOR DE SEPARACION $\frac{(D/H)_{\text{SOLIDO}}}{(D/H)_{\text{LIQUIDO}}}$, CALCULADO A PARTIR DE DATOS TERMODINAMICOS

$$\alpha = 1,0195 \text{ a } -2^{\circ}\text{C},$$

$$\alpha = 1,0192 \text{ a } 0^{\circ}\text{C}$$

13-p.52



- o Determinación directa de la composición del líquido y del vapor.
- ◊ Puntos calculados a partir de la aproximación:

$$\alpha = \sqrt{P_{H_2O}^{\circ} / P_{D_2O}^{\circ}}$$

13-p.56

FACTOR DE SEPARACION DE ISOTOPOS POR DESTILACION FRACCIONADA.

Factor de separación α para HDO deducido de una columna de destilación.

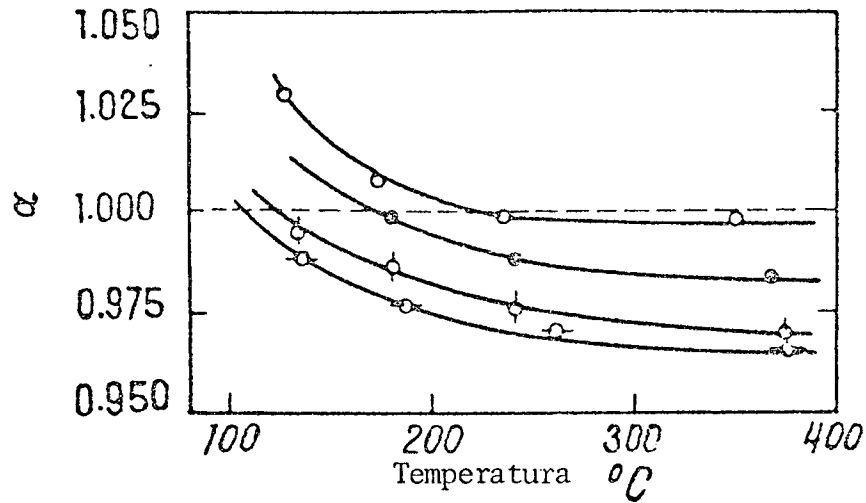
$\alpha = 1,038 \pm 0,003$ para $P = 250$ a 350 mm Hg.

13-p.52.

FACTOR DE SEPARACION α DE MEZCLAS D_2O-H_2O EN PRESENCIA DE DIFERENTES SOLUTOS.

Soluto	Fracción molar del soluto	Temperatura de inversión	α menor	Variación de la temperatura de inversión, Δ	$\Delta \alpha$
		220	0,997		
AgF	0,100	208	,998	12	0,009
KF	,100	190	,990	30	,007
KCl	,101	146	,989	74	,008
KBr	,101	152	,987	68	,010
KI	,103	139	,992	81	,005
NaI	,092	153	,990	67	,007
LiI	,150	106	,965	114	,032
LiI	,143	124	,969	96	,028
LiI	,100	170	,983	50	,014
LiI	,0005	220	,997	0	,000
ZnI ₂	,100	174	,986	46	,011
Na ₂ SO ₄	,100	220	,985	0	,012
K ₂ PO ₄	,100	83	,966	137	,031

15-p.57



Factor de separación de mezclas D_2O/H_2O en presencia de ILi, de fracciones molares: 0,0005 (O), 0,100 (⊗), 0,150 (Θ) y 0,143 (Ø).
13-p.57

INDICE DE REFRACCION n PARA LA LINEA D DEL SODIO.

	$T, ^\circ C$	n
H_2O	23,1	1,3326
D_2O (99,8%)	22,0	1,3283

13-p.9

INDICE DE REFRACCION n DE MEZCLAS DE AGUA PESADA Y LIVIANA.

$$- \Delta n \cdot 10^7 = 48662 x - 143 x^2 \text{ para } \lambda = 5461 \text{ A}^\circ$$

$$- \Delta n \cdot 10^7 = 52960 x - 174 x^2 \text{ para } \lambda = 4538 \text{ A}^\circ$$

$$\text{donde } \Delta n = n_{D_2O} - n_{H_2O},$$

y x = relación de concentraciones D_2O/H_2O

13-p.9

PRESIONES EXPERIMENTALES DE SATURACION
DEL D₂O 99,87%

p , kg/cm ²	t_{obs} , °C	ΔT , °C	p , kg/cm ²	t_{obs} , °C	ΔT , °C
18.72	208.21	-0.141	71.33	285.05	0.708
22.11	216.55	-0.047	84.68	296.77	0.832
22.62	219.92	-0.010	96.34	305.89	0.927
23.90	220.55	-0.007	100.88	309.23	0.952
23.96	220.66	-0.003	112.12	316.96	1.063
23.97	220.68	0.000	126.00	325.74	1.150
24.06	220.89	0.004	126.50	326.04	1.162
24.27	221.34	0.008	142.19	335.04	1.268
24.65	222.15	0.019	155.76	342.24	1.343
24.95	222.78	0.023	175.20	351.67	1.468
25.32	223.55	0.033	192.41	359.30	1.575
25.63	224.19	0.035	208.40	365.85	1.68
26.08	225.11	0.049	213.56	367.87	1.70
26.47	225.90	0.051	216.96	369.12	1.75
27.07	227.09	0.063	220.20	370.41	1.72
27.14	227.22	0.065	220.63	370.51	1.78
28.82	230.45	0.107	222.04	370.75	2.08
29.18	231.12	0.115	223.31	370.9	2.39
42.94	253.05	0.362	224.30	370.9	2.71
56.95	270.39	0.514	229.88	370.9	3.2

15-p.9

VALORES DE LAS CONSTANTES CRITICAS DEL AGUA PESADA

	T_c (°K)	P_c (atm)	V_c (cc)
Obs	644.6	218.6	55.2
Calc	720.0	360.4	59.0
% error	11.7	64.8	6.88

6-p.1470

TEMPERATURA CRITICA.

D₂O : 370,9 ± 0,1°C

13-p.56

D₂O : 371,5 °CH₂O : 374,2 °C

13-p.57

DATOS DE CONSTANTES CRITICAS POR DIFERENTES AUTORES

Autores	$t_{cr}, ^\circ C$	Método	$P_{cr}, kg/cm^2$	Método	$v_{cr}, cm^3/g$	Método
Riesenfeld y Chang	371.5	(1)	275.8	(3)	2.75	(4)
Oliver y Grisard	370.9 370.8 $\pm$ 0.1	(2)	222.9 $\pm$ 0.4	(2)	----	---
		(1)	-----	---	----	---
H. Eck	371.5*	(1)	221.5*	(1)	2.74*	(4)
Hebert y otros	-----	---	-----	---	2.75	(1)
Ravikovich y Solomko	371.5	---	-----	---	----	---
Kirillin y Ulybin	-----	---	-----	---	2.93	(5)

* Obtenido por extrapolación de datos de soluciones de $D_2O - H_2O$ con concentraciones de 71,7 y 89,0% de D_2O .

(1) Capilar de cuarzo cerrado.

(2) Ebuliométrico.

(3) Igualdad de coeficientes del H_2O y D_2O

(4) Capilar de cuarzo cerrado y regla del diámetro rectilíneo.

(5) Análisis de las relaciones de p, v, t en las cercanías de p_c .

15-p.13

PRESION DE SATURACION PARA D₂O

T (°C)	300	350	360	369	371
P. media (atm.abs)	88,70	171,75	193,92	216,38	221,44

13-p.58

DIFERENCIAS ENTRE LAS PRESIONES DE
SATURACION DEL D₂O Y H₂O

<i>t</i> , °C	$P_{D_2O} - P_{H_2O}$ mm Hg	P_{D_2O} mm Hg	Error exp. estimado, mm Hg
10	-1.46	7.75	±0.1
20	-2.48	15.06	±0.1
30	-4.01	27.81	±0.1
40	-6.19	49.13	±0.1
50	-9.14	83.37	±0.1
60	-12.97	136.41	±0.2
70	-17.8	215.9	±0.3
80	-23.5	331.6	±0.3
90	-30.2	495.6	±0.4
100	-37.7	722.3	±0.4
110	-45.7	1028.9	±0.7
120	-54.1	1435.1	±1.0
130	-62.5	1963.8	±1.0
140	-70.4	2640.4	±1.5
150	-77.3	3493.4	±2.0
160	-82.6	4553.9	±2.0
170	-85.6	5856.1	±2.0
180	-85.1	7436.9	±2.0
190	-80.1	9336.3	±2.0
200	-68.9	11596.3	±2.0
210	-49.1	14262.5	±2.0
220	-17.9	17384.6	±2.0
230	+28.8	21014.6	±2.0
240	+96.2	25207.3	±5.0

15-p.3

VALORES EXPERIMENTALES DE LAS DIFERENCIAS ENTRE PRESIONES DE SATURACION DE AGUA Y AGUA PESADA

$t, ^\circ\text{C}$	$P_{\text{H}_2\text{O}} - P_{\text{D}_2\text{O}}, \text{mm Hg}$	$t, ^\circ\text{C}$	$P_{\text{H}_2\text{O}} - P_{\text{D}_2\text{O}}, \text{mm Hg}$	$t, ^\circ\text{C}$	$P_{\text{H}_2\text{O}} - P_{\text{D}_2\text{O}}, \text{mm Hg}$
21.8	2.5	116.5	52.3	179.2	82.9
29.4	3.6	119.6	54.7	183.8	75.8
35.4	4.4	125.3	59.8	186.8	77.8
40.9	5.6	131.4	64.8	189.0	76.1
45.2	6.7	139.5	70.9	190.2	74.0
50.8	8.1	140.8	71.8	194.2	64.9
62.0	12.9	150.1	77.4	195.7	69.4
70.0	16.2	151.0	78.2	200.4	58.2
74.1	18.5	160.1	81.4	204.5	52.4
76.6	20.1	163.0	81.8	206.0	55.4
80.9	23.3	164.0	82.6	211.7	37.0
87.1	27.2	167.2	81.7	214.2	35.5
93.3	32.4	167.6	83.6	219.5	17.5
96.2	34.5	170.1	82.5	220.7	13.2
97.5	35.7	171.1	82.0	221.6	12.2
99.5	36.8	172.3	81.5	224.7	3.6
100.6	38.8	174.5	82.3	229.1	-14.9
107.5	43.9	178.2	79.9	231.1	-13.5
114.0	49.7	178.6	80.9	232.6	-32.4

15-p.5

TEMPERATURAS CRITICAS DE SOLUCIONES DE $\text{D}_2\text{O}-\text{H}_2\text{O}$ A DIFERENTES CONCENTRACIONES

N	0.00012*	0.221	0.456	0.709	0.980	0.991
t_{cr} , medidas en tubos indiv. $^\circ\text{C}$	360.1 360.1 360.2 359.9 360.1	359.6 359.3 359.3 359.2 -----	358.9 358.5 358.9 358.8 -----	357.9 358.0 358.0 ----- -----	357.3 357.5 357.6 357.5 357.4	357.4 357.5 357.8 357.4 357.5
t_{cr} , promed. en todos los tubos, $^\circ\text{C}$	360.1	359.4	358.8	358.0	357.5	357.5
t_{cr} , correg. para $t_{\text{crH}_2\text{O}}, ^\circ\text{C}$	374.2	373.5	372.9	372.1	371.5	371.5

(*) Agua practicamente pura.

15-p.11

DATOS EXPERIMENTALES DE PRESIONES DE SATURACION DEL H_2O Y D_2O

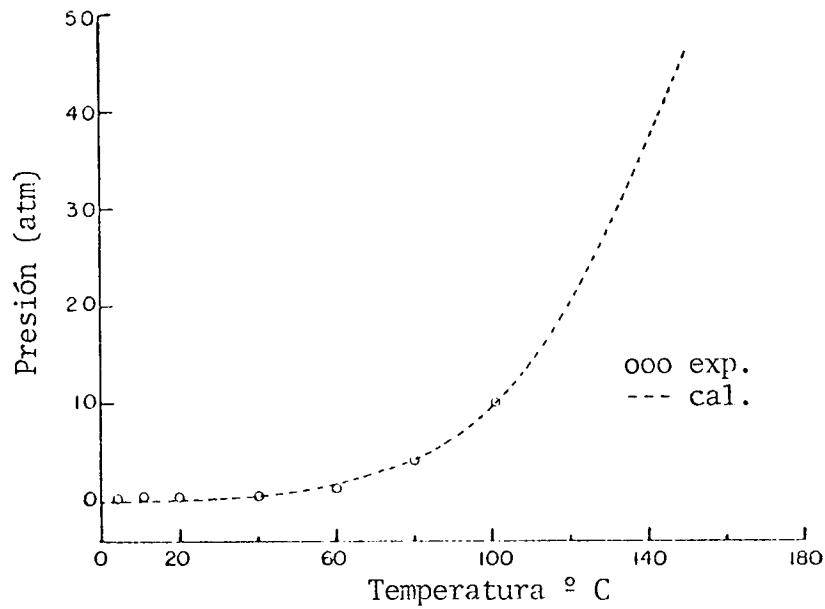
$t, ^\circ C$	P_{H_2O}		$P_{H_2O} - P_{D_2O}$	P_{D_2O}		$\frac{P_{D_2O}}{P_{H_2O}}$
	atm	kg/cm ²		atm	kg/cm ²	
3.8	0.007915	0.008178	0.96	0.00666	0.00688	0.841
10	0.01212	0.01252	1.3	0.01035	0.01069	0.854
20	0.02307	0.02384	2.3	0.02009	0.02076	0.871
30	0.04187	0.04326	3.7	0.03705	0.03828	0.885
40	0.07279	0.07521	5.7	0.06529	0.06746	0.897
50	0.1217	0.1257	8.5	0.1105	0.1142	0.908
60	0.1966	0.2031	12.2	0.1805	0.1865	0.918
70	0.3075	0.3177	17.1	0.2850	0.2945	0.927
80	0.4672	0.4827	23.1	0.4368	0.4513	0.935
90	0.6918	0.7148	30.0	0.6523	0.6740	0.943
100	1.0000	1.0332	37.8	0.9503	0.9819	0.9503
110	1.4139	1.4609	46.5	1.3527	1.3976	0.9567
120	1.9595	2.0246	55.2	1.8869	1.9496	0.9629
130	2.6662	2.7548	63.6	2.5825	2.6683	0.9686
140	3.5669	3.6854	71.1	3.4733	3.5887	0.9738
150	4.6982	4.8543	77.2	4.5966	4.7493	0.9784
160	6.1003	6.3030	81.3	5.9933	6.1924	0.9825
170	7.8169	8.0766	82.6	7.7082	7.9643	0.9861
180	9.8949	10.2237	80.3	9.7892	10.1145	0.9893
190	12.385	12.796	73.5	12.288	12.696	0.9922
200	15.341	15.851	61.3	15.260	15.767	0.9947
210	18.819	19.444	42.6	18.763	19.386	0.9970
220	22.881	23.641	16.5	22.859	23.619	0.9990
225	25.151	25.987	0.0	25.151	25.987	1.0000
230	27.591	28.508	18.1	27.615	28.533	1.0009
371.5	211.615	218.647	5309	218.6	225.86	1.033

15-p.5

VALORES CRITICOS DEL AGUA

	$T_c (^\circ K)$	$P_c (atm)$	$V_c (CC)$
Obs	647.2	218.3	56.3
Calc	746.0	377.5	58.6
% error	15.27	72.83	4.09

6-p.1468



Presión de vapor del D_2O en función de la temperatura.

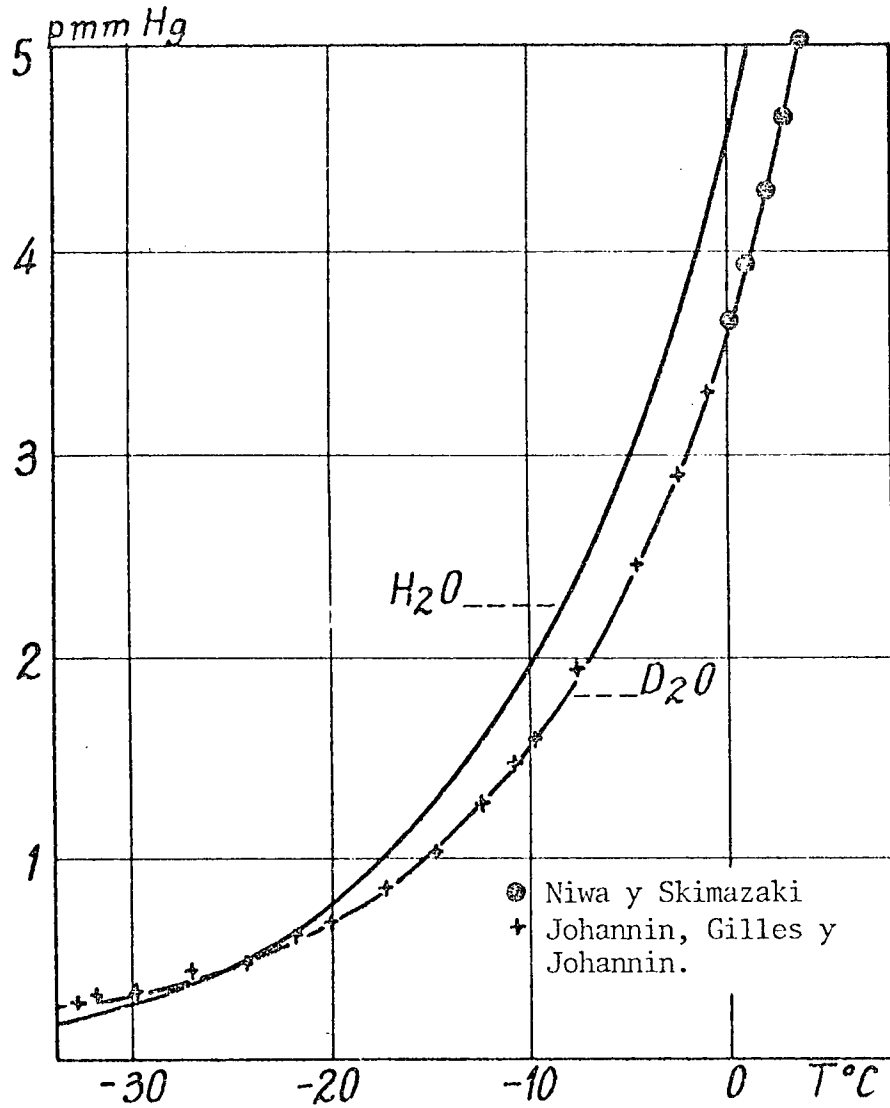
6-p.1470

VOLUMEN MOLAR Y PRESION DE VAPOR DEL AGUA

T(°K)	V calc. (CC)	% error	P calc. (atm)	P obs. (atm)	% error
273.15(PF)	17.923	- 0.53	0.006051	0.006030	- 0.35
277.15	17.888	- 0.71	0.008036	0.008007	- 0.36
283.15	17.891	- 0.72	0.01210	0.01218	- 0.66
293.15	17.961	- 0.48	0.02298	0.02307	- 0.39
313.15	18.171	0.08	0.07234	0.07279	- 0.62
353.15	18.673	0.73	0.4623	0.4672	- 1.05
373.15(PE)	18.959	0.85	0.9852	1.0000	- 1.48
423.15	19.800	0.81	4.549	4.698	- 3.17

6-p. 1468.

6-p. 1468



Presión de vapor del H_2O y D_2O sólidos.

13-p.51

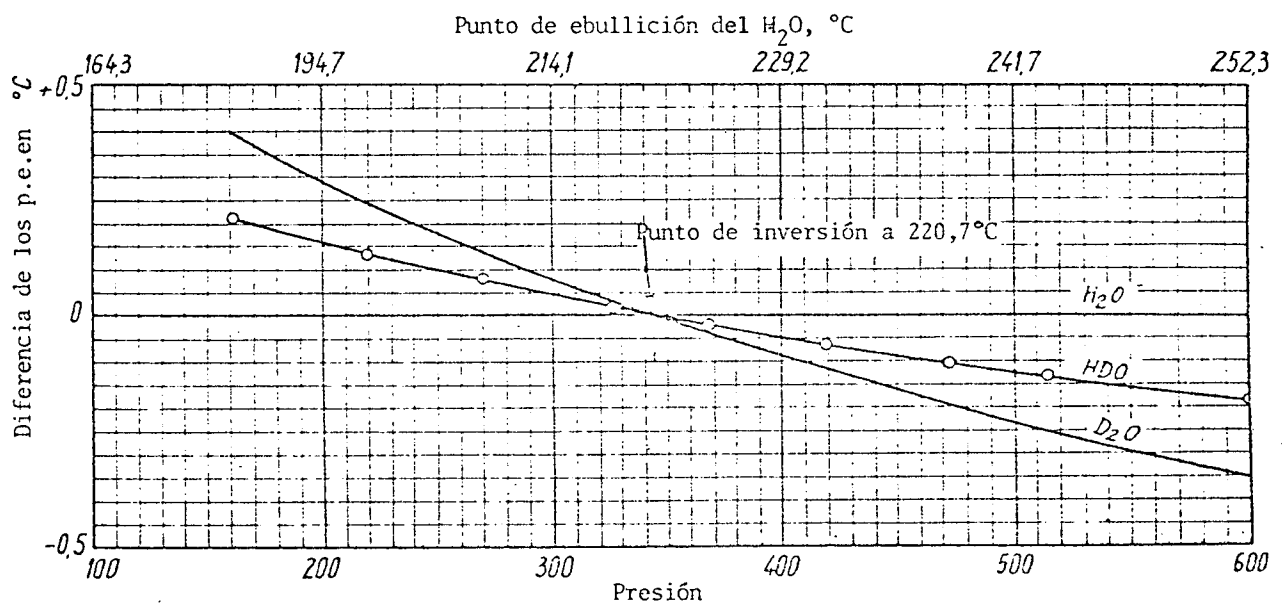
PRESION DE VAPOR DEL D_2O SOLIDO (mm de Hg)

$T (^{\circ}\text{C})$	$p_{\text{D}_2\text{O}}$	$p_{\text{H}_2\text{O}}$	$\frac{p_{\text{H}_2\text{O}}}{p_{\text{D}_2\text{O}}}$	$T (^{\circ}\text{C})$	$p_{\text{D}_2\text{O}}$	$p_{\text{H}_2\text{O}}$	$\frac{p_{\text{H}_2\text{O}}}{p_{\text{D}_2\text{O}}}$
- 32.....	0,34 ₅	0,23 ₂	0,67	- 14...	1,13 ₅	1,36 ₂	1,20
- 30.....	0,37 ₃	0,28 ₅	0,76	- 12...	1,33 ₅	1,63 ₃	1,22
- 28.....	0,42 ₃	0,35 ₁	0,83	- 10...	1,57 ₈	1,95 ₆	1,235
- 26.....	0,46 ₃	0,43 ₃	0,92	- 8...	1,85 ₅	2,32 ₆	1,25
- 24.....	0,52 ₃	0,52 ₅	1,00	- 6...	2,20 ₀	2,76 ₅	1,26
- 22.....	0,61 ₅	0,64 ₀	1,04	- 4...	2,58 ₀	3,28 ₀	1,27
- 20.....	0,71 ₄	0,77 ₅	1,08	- 2...	3,03 ₂	3,88 ₀	1,28
- 18.....	0,83 ₂	0,93 ₉	1,12	- 0...	3,61 ₃	4,57 ₅	1,26
- 16.....	0,97 ₃	0,13 ₂	1,17	+ 2	4,28 ₅	5,29 ₄	1,23

PRESION DE VAPOR DEL H_2O Y D_2O Y DE MEZCLA EQUIMOLECULAR EQUILIBRADA DE D_2O
Y H_2O (designada como HDO)

Presión (psia)	T (°C) H ₂ O	T (°C) "HDO"	Δ T (H ₂ O - HDO) (°C)
161,36	184,57	184,78	- 0,216
219,40	198,68	198,81	- 0,132
265,85	208,00	208,08	- 0,084
325,97	218,34	218,36	- 0,023
367,54	224,66	224,64	0,018
420,51	231,95	231,89	0,058
472,14	238,41	238,31	0,102
514,24	243,28	243,15	0,126
619,38	254,24	254,05	0,187
1607,7	318,62	318,09	0,532
3017,5	369,01	368,04	0,969
3143,3	372,42	371,26	1,164
3144,1	372,45	371,29	1,152

13-p.53



Presiones de vapor de H_2O , D_2O y de mezclas equimoleculares equilibradas.

13-p.53

PRESION DE VAPOR Y FACTOR DE SEPARACION PARA MEZCLAS D₂O/H₂O

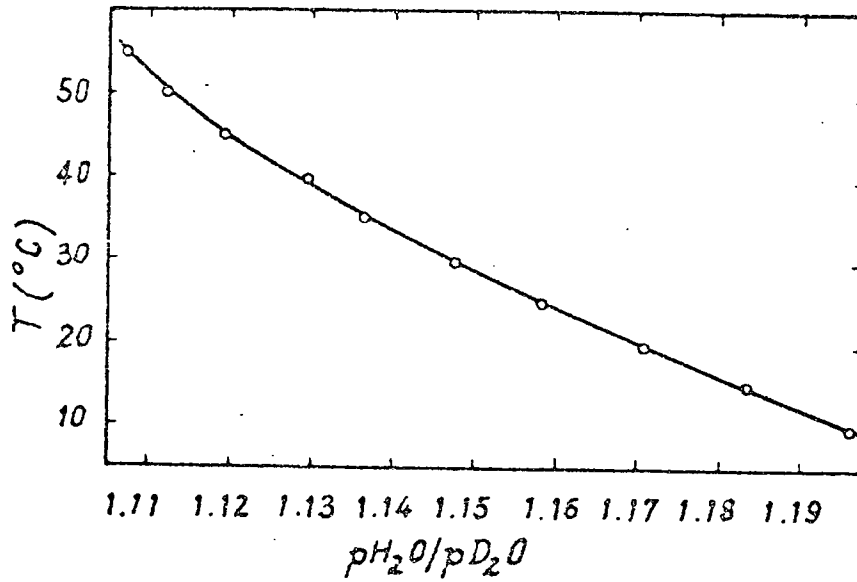
T (°C)	% D ₂ O	P (mm. Hg)	α	$\sqrt{\frac{P_{H_2O}}{P_{D_2O}}}$
9,84	48,23	8,45	1,1003	1,094
20,00	45,97	16,30	1,0873	1,082
25,00	45,97	22,19	1,0815	1,076
30,00	45,97	29,91	1,0747	1,071
30,01	48,24	29,87	1,0749	1,071
40,01	48,22	52,31	1,0629	1,063
50,00	48,21	87,86	1,0510	1,055

13-p.54

PRESION DE VAPOR DEL D₂O

T (°C)	P_{H_2O} / P_{D_2O}	P_{H_2O} (mm. Hg)	P_{D_2O} (mm. Hg)
10,00	1,196	9,21	7,70
14,98	1,183	12,79	10,81
20,01	1,171	17,54	14,98
25,08	1,158	23,76	20,51
30,01	1,148	31,82	27,72
35,00	1,137	42,18	37,11
40,03	1,130	55,32	49,0
44,99	1,119	71,88	64,2
50,01	1,112	92,5	83,2
55,00	1,107	118,0	106,6

13-p.54



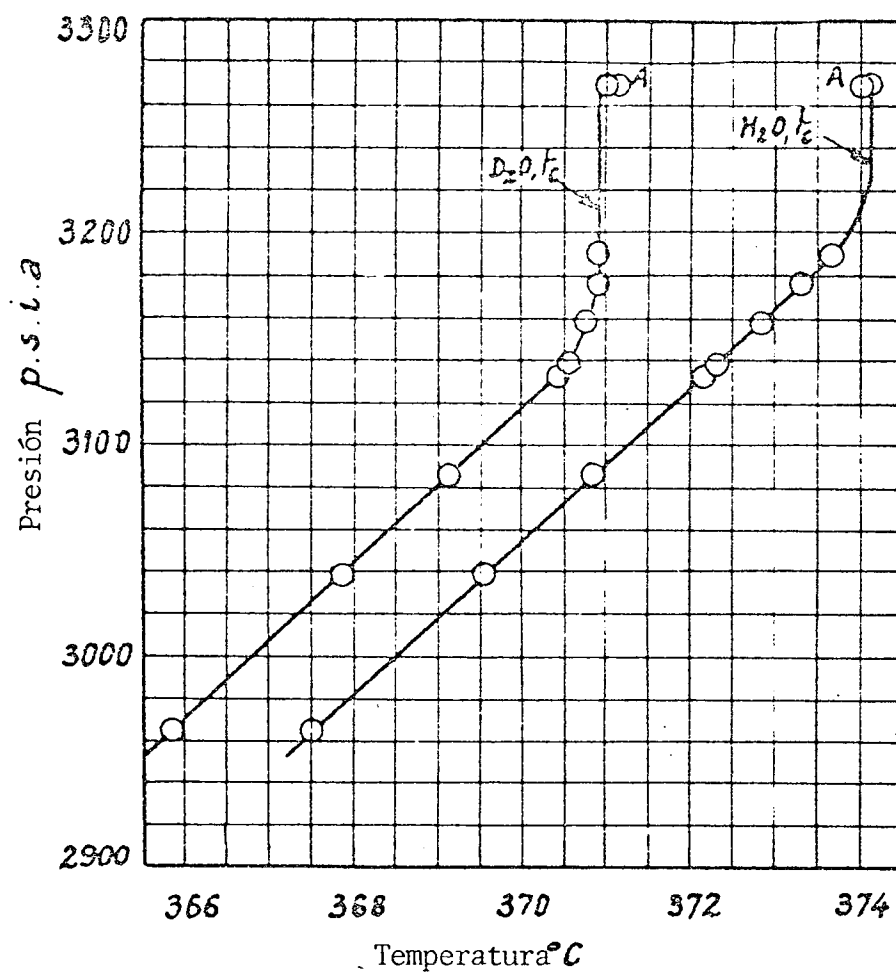
Relación de presiones de vapor del H_2O y D_2O .

13-p.54

PRESION DE VAPOR DEL D_2O Y DIFERENCIA ENTRE LOS PUNTOS DE EBULLICION DEL H_2O Y D_2O

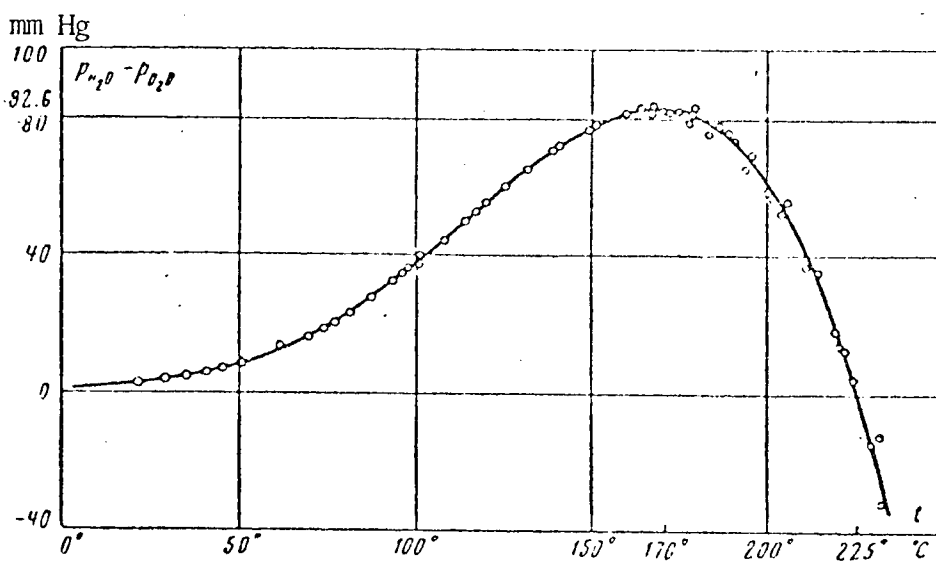
Presión (psia)	T. observada (°C)	ΔT , (°C)	Presión (psia)	T. observada (°C)	ΔT , (°C)
266,21	208,21	- 0,141	1014,7	285,05	0,708
314,54	216,55	- ,047	1204,5	296,77	,832
335,94	219,92	- ,010	1370,4	305,89	,927
340,00	220,55	- ,007	1435,0	309,23	,952
340,79	220,66	- ,003	1594,9	316,96	1,063
340,92	220,68	,000	1792,3	325,74	1,150
342,27	220,89	,004	1799,5	326,04	1,162
345,29	221,34	,008	2022,6	335,04	1,268
350,71	222,15	,019	2215,6	342,24	1,343
354,91	222,78	,023	2492,3	351,67	1,468
360,18	223,55	,033	2737,0	359,30	1,575
364,53	224,19	,035	2964,5	365,85	1,68
371,00	225,11	,049	3037,9	367,87	1,70
376,46	225,90	,051	3086,2	369,12	1,75
385,03	227,09	,063	3132,3	370,41	1,72
386,03	227,22	,065	3138,4	370,51	1,78
410,00	230,45	,107	3158,5	370,75	2,08
415,04	231,12	,115	3176,5	370,9	2,39
610,89	253,05	,362	3190,6	370,9	2,71
810,15	270,39	,544	3270 ± 10	370,9	3,2

ΔT = temperatura de ebullición del H_2O - temperatura de ebullición del D_2O .



Punto de ebullición del D_2O y H_2O en las vecindades del punto crítico.

13-p.55



Valores experimentales de diferencias de presiones de agua y agua pesada.

15-p.6

PRESION DE VAPOR SOBRE HIELO (mm de Hg)

°C	0	2	4	6	8
-90	.000070	.000048	.000033	.000022	.000015
-80	.00040	.00029	.00020	.00014	.00010
-70	.00194	.00143	.00105	.00077	.00056
-60	.00808	.00614	.00464	.00349	.00261
-50	.02955	.0230	.0178	.0138	.0106
-40	.0966	.0768	.0609	.0481	.0378
-30	.2859	.2318	.1873	.1507	.1209
°C	0.0	0.2	0.4	0.6	0.8
-29	0.317	0.311	0.304	0.298	0.292
-28	0.351	0.344	0.337	0.330	0.324
-27	0.389	0.381	0.374	0.366	0.359
-26	0.430	0.422	0.414	0.405	0.397
-25	0.476	0.467	0.457	0.448	0.439
-24	0.526	0.515	0.505	0.495	0.486
-23	0.580	0.569	0.558	0.547	0.536
-22	0.640	0.627	0.615	0.603	0.592
-21	0.705	0.691	0.678	0.665	0.652
-20	0.776	0.761	0.747	0.733	0.719
°C	0.0	0.2	0.4	0.6	0.8
-19	0.854	0.838	0.822	0.806	0.791
-18	0.939	0.921	0.904	0.887	0.870
-17	1.031	1.012	0.993	0.975	0.956
-16	1.132	1.111	1.091	1.070	1.051
-15	1.241	1.219	1.196	1.175	1.153
-14	1.361	1.336	1.312	1.288	1.264
-13	1.490	1.464	1.437	1.411	1.386
-12	1.632	1.602	1.574	1.546	1.518
-11	1.785	1.753	1.722	1.691	1.661
-10	1.950	1.916	1.883	1.849	1.817
-9	2.131	2.093	2.057	2.021	1.985
-8	2.326	2.285	2.246	2.207	2.168
-7	2.537	2.493	2.450	2.408	2.367
-6	2.765	2.718	2.672	2.626	2.581
-5	3.013	2.962	2.912	2.862	2.813
-4	3.280	3.225	3.171	3.117	3.065
-3	3.568	3.509	3.451	3.393	3.336
-2	3.880	3.816	3.753	3.691	3.630
-1	4.217	4.147	4.079	4.012	3.946
-0	4.579	4.504	4.431	4.359	4.287

PRESION DE VAPOR DEL AGUA EN mm de Hg

Temp. °C	0.0	0.2	0.4	0.6	0.8	Temp. °C	0.0	0.2	0.4	0.6	0.8
-15	1.436	1.414	1.390	1.368	1.345	42	61.50	62.14	62.80	63.46	64.12
-14	1.560	1.534	1.511	1.485	1.460	43	64.80	65.48	66.16	66.86	67.56
-13	1.691	1.665	1.637	1.611	1.585	44	68.26	68.97	69.69	70.41	71.14
-12	1.834	1.804	1.776	1.748	1.720	45	71.88	72.62	73.36	74.12	74.88
-11	1.987	1.955	1.924	1.893	1.863	46	75.65	76.43	77.21	78.00	78.80
-10	2.149	2.116	2.084	2.050	2.018	47	79.60	80.41	81.23	82.05	82.87
-9	2.326	2.289	2.254	2.219	2.184	48	83.71	84.56	85.42	86.28	87.14
-8	2.514	2.475	2.437	2.399	2.362	49	88.02	88.90	89.79	90.69	91.59
-7	2.715	2.674	2.633	2.593	2.553	50	92.51	93.5	94.4	95.3	96.3
-6	2.931	2.887	2.843	2.800	2.757	51	97.20	98.2	99.1	100.1	101.1
-5	3.163	3.115	3.069	3.022	2.976	52	102.09	103.1	104.1	105.1	106.2
-4	3.410	3.359	3.309	3.259	3.211	53	107.20	108.2	109.3	110.4	111.4
-3	3.673	3.620	3.567	3.514	3.461	54	112.51	113.6	114.7	115.8	116.9
-2	3.956	3.898	3.841	3.785	3.730	55	118.04	119.1	120.3	121.5	122.6
-1	4.258	4.196	4.135	4.075	4.016	56	123.80	125.0	126.2	127.4	128.6
0	4.579	4.513	4.448	4.385	4.320	57	129.82	131.0	132.3	133.5	134.7
1	4.926	4.858	4.791	4.725	4.658	58	136.08	137.3	138.5	139.9	141.2
2	5.294	5.225	5.157	5.090	5.022	59	142.60	143.9	145.2	146.6	148.0
3	5.685	5.615	5.546	5.477	5.407	60	149.38	150.7	152.1	153.5	155.0
4	6.101	6.030	5.959	5.888	5.817	61	156.43	157.8	159.3	160.8	162.3
5	6.543	6.471	6.399	6.327	6.255	62	163.77	165.2	166.8	168.3	169.8
6	7.013	6.940	6.867	6.794	6.721	63	171.38	172.9	174.5	176.1	177.7
7	7.513	7.439	7.365	7.291	7.217	64	179.31	180.9	182.5	184.2	185.8
8	8.045	7.970	7.895	7.820	7.745	65	187.54	189.2	190.9	192.6	194.3
9	8.609	8.533	8.457	8.381	8.305	66	196.09	197.8	199.5	201.3	203.1
10	9.209	9.132	9.055	8.978	8.901	67	204.96	206.8	208.6	210.5	212.3
11	9.844	9.766	9.688	9.610	9.532	68	214.17	216.0	218.0	219.9	221.8
12	10.518	10.439	10.360	10.281	10.202	69	223.73	225.7	227.7	229.7	231.7
13	11.231	11.151	11.071	10.991	10.911	70	233.7	235.7	237.7	239.7	241.8
14	11.987	11.906	11.825	11.744	11.663	71	243.9	246.0	248.2	250.3	252.4
15	12.788	12.706	12.624	12.542	12.460	72	254.6	256.8	259.0	261.2	263.4
16	13.634	13.551	13.468	13.385	13.302	73	265.7	268.0	270.2	272.6	274.8
17	14.530	14.446	14.362	14.278	14.194	74	277.2	279.4	281.8	284.2	286.6
18	15.477	15.392	15.307	15.222	15.137	75	289.1	291.5	294.0	296.4	298.8
19	16.477	16.391	16.305	16.219	16.133	76	301.4	303.8	306.4	308.9	311.4
20	17.535	17.448	17.361	17.274	17.187	77	314.1	316.6	319.2	322.0	324.6
21	18.650	18.562	18.474	18.386	18.298	78	327.3	330.0	332.8	335.6	338.2
22	19.827	19.738	19.649	19.560	19.471	79	341.0	343.8	346.6	349.4	352.2
23	21.068	20.978	20.888	20.798	20.708	80	355.1	358.0	361.0	363.8	366.8
24	22.377	22.286	22.195	22.104	22.013	81	369.7	372.6	375.6	378.8	381.8
25	23.756	23.664	23.572	23.480	23.388	82	384.9	388.0	391.2	394.4	397.4
26	25.209	25.116	25.023	24.930	24.837	83	400.6	403.8	407.0	410.2	413.6
27	26.739	26.645	26.551	26.457	26.363	84	416.8	420.2	423.6	426.8	430.2
28	28.349	28.254	28.159	28.064	27.969	85	433.6	437.0	440.4	444.0	447.5
29	30.043	29.947	29.851	29.755	29.659	86	450.9	454.4	458.0	461.6	465.2
30	31.824	31.727	31.630	31.533	31.436	87	468.7	472.4	476.0	479.8	483.4
31	33.695	33.597	33.499	33.401	33.303	88	487.1	491.0	494.7	498.5	502.2
32	35.663	35.564	35.465	35.366	35.267	89	506.1	510.0	513.9	517.8	521.8
33	37.729	37.629	37.529	37.429	37.329	90	525.76	529.77	533.80	537.86	541.95
34	39.898	39.797	39.696	39.595	39.494	91	546.05	550.18	554.35	558.53	562.75
35	42.175	42.073	41.971	41.869	41.767	92	566.99	571.26	575.55	579.87	584.22
36	44.563	44.460	44.357	44.254	44.151	93	588.60	593.06	597.43	601.89	606.38
37	47.067	46.963	46.859	46.755	46.651	94	610.90	615.44	620.01	624.61	629.24
38	49.692	49.587	49.482	49.377	49.272	95	633.90	638.59	643.30	648.05	652.82
39	52.442	52.336	52.230	52.124	52.018	96	657.62	662.45	667.31	672.20	677.12
40	55.324	55.217	55.110	55.003	54.896	97	682.07	687.04	692.05	697.10	702.17
41	58.34	58.231	58.123	58.015	57.907	98	707.27	712.40	717.56	722.75	727.98
						99	733.24	738.53	743.85	749.20	754.58
						100	760.00	765.45	770.93	776.44	782.00
						101	787.57	793.18	798.82	804.50	810.21

PRESION DE VAPOR DEL AGUA

Temp. °C	Presión		Temp. °F	Temp. °C	Presión		Temp. °F	Temp. °C	Presión		Temp. °F	Temp. °C	Presión		Temp. °F
	mm	Libra por pulg. ²			mm	Libra por pulg. ²			mm	Libra por pulg. ²			mm	Libra por pulg. ²	
100	760.	14.696	212.0	170	5940.92	114.879	328.0	240	25100.52	485.365	464.0	310	74024.00	1431.399	590.0
101	787.51	15.228	213.8	171	6085.32	117.671	329.8	241	25544.60	489.933	465.8	311	75012.10	1451.083	591.8
102	815.86	15.776	215.6	172	6233.52	120.537	331.6	242	25994.28	494.617	467.6	312	76016.00	1471.070	593.6
103	845.12	16.342	217.4	173	6385.24	123.432	333.4	243	26449.36	511.450	469.4	313	77117.26	1491.203	595.4
104	875.06	16.921	219.2	174	6538.28	126.430	335.2	244	26912.36	520.400	471.2	314	78168.00	1511.484	597.2
105	906.07	17.521	221.0	175	6694.08	129.442	337.0	245	27384.28	529.467	473.0	315	79230.00	1532.058	599.0
106	937.92	18.136	222.8	176	6852.92	132.514	338.8	246	27857.52	538.658	474.8	316	80294.00	1552.632	600.8
107	970.60	18.768	224.6	177	7015.56	135.659	340.6	247	28332.81	547.926	476.6	317	81373.20	1573.591	602.6
108	1004.42	19.422	226.4	178	7180.48	138.848	342.4	248	28819.76	557.360	478.4	318	82467.60	1594.653	604.4
109	1038.92	20.089	228.2	179	7349.20	142.110	344.2	249	29317.00	566.868	480.2	319	83569.00	1615.972	606.2
110	1074.56	20.779	230.0	180	7520.20	145.417	346.0	250	29817.84	576.553	482.0	320	84686.80	1637.575	608.0
111	1111.20	21.487	231.8	181	7694.24	148.762	347.8	251	30321.00	586.370	483.8	321	85819.20	1659.472	609.8
112	1148.74	22.213	233.6	182	7872.08	152.231	349.6	252	30827.76	596.305	485.6	322	86959.00	1681.576	611.6
113	1187.42	22.961	235.4	183	8052.66	155.719	351.4	253	31336.84	606.342	487.4	323	88114.40	1703.854	613.4
114	1227.25	23.731	237.2	184	8236.88	159.275	353.2	254	31848.04	616.566	489.2	324	89277.20	1726.359	615.2
115	1267.98	24.519	239.0	185	8423.84	162.890	355.0	255	32361.50	626.858	491.0	325	90447.60	1748.971	617.0
116	1309.04	25.330	240.8	186	8613.12	166.609	356.8	256	32876.40	637.292	492.8	326	91633.20	1771.897	618.8
117	1352.95	26.162	242.6	187	8805.92	170.356	358.6	257	33393.56	647.885	494.6	327	92826.40	1794.999	620.6
118	1397.18	27.017	244.4	188	9000.52	174.177	360.4	258	33913.84	658.601	496.4	328	94027.60	1818.343	622.4
119	1442.63	27.896	246.2	189	9208.16	178.073	362.2	259	34436.76	669.417	498.2	329	95237.20	1841.291	624.2
120	1489.14	28.795	248.0	190	9418.36	182.025	364.0	260	34961.00	680.425	500.0	330	96451.40	1864.245	626.0
121	1536.80	29.717	249.8	191	9626.68	186.032	365.8	261	35486.80	691.520	501.8	331	97673.80	1887.346	627.8
122	1586.04	30.669	251.6	192	9831.36	190.107	367.6	262	36013.20	702.763	503.6	332	98902.40	1910.742	629.6
123	1636.36	31.642	253.4	193	10047.20	194.281	369.4	263	36542.20	714.152	505.4	333	100297.20	1934.431	631.4
124	1687.81	32.637	255.2	194	10265.32	198.499	371.2	264	37072.56	725.793	507.2	334	101581.60	1958.267	633.2
125	1740.93	33.664	257.0	195	10488.76	202.819	373.0	265	37603.00	737.572	509.0	335	102881.20	1982.398	635.0
126	1795.12	34.712	258.8	196	10715.24	207.192	374.8	266	38134.52	749.498	510.8	336	104186.00	2006.822	636.8
127	1850.83	35.789	260.6	197	10944.76	211.637	376.6	267	38667.12	761.572	512.6	337	105496.00	2031.546	638.6
128	1907.83	36.891	262.4	198	11179.60	216.178	378.4	268	39201.84	773.815	514.4	338	106811.20	2056.562	640.4
129	1966.35	38.023	264.2	199	11417.48	220.778	380.2	269	39738.12	786.235	516.2	339	108132.00	2081.710	642.2
130	2026.16	39.180	266.0	200	11659.16	225.451	382.0	270	40276.00	798.841	518.0	340	109459.20	2107.063	644.0
131	2087.42	40.364	267.8	201	11905.40	230.213	383.8	271	40816.20	811.641	519.8	341	110792.60	2132.615	645.8
132	2150.42	41.582	269.6	202	12155.44	235.043	385.6	272	41358.56	824.634	521.6	342	112132.00	2158.367	647.6
133	2214.64	42.824	271.4	203	12409.52	239.942	387.4	273	41902.96	837.829	523.4	343	113477.20	2184.319	649.4
134	2280.76	44.103	273.2	204	12666.16	244.924	389.2	274	42449.16	851.229	525.2	344	114828.00	2210.470	651.2
135	2347.26	45.429	275.0	205	12923.12	250.004	391.0	275	42996.84	864.833	527.0	345	116184.40	2236.814	653.0
136	2416.34	46.794	276.8	206	13181.96	255.166	392.8	276	43546.00	878.640	528.8	346	117546.40	2263.351	654.8
137	2486.16	48.113	278.6	207	13442.66	260.428	394.6	277	44096.84	892.657	530.6	347	118913.20	2290.181	656.6
138	2560.67	49.515	280.4	208	13705.32	265.783	396.4	278	44648.80	906.883	532.4	348	120285.60	2317.304	658.4
139	2634.84	50.950	282.2	209	14022.76	271.156	398.2	279	45201.84	921.317	534.2	349	121663.20	2344.729	660.2
140	2710.92	52.421	284.0	210	14305.48	276.623	400.0	280	45756.40	935.953	536.0	350	123046.00	2372.454	662.0
141	2788.41	53.920	285.8	211	14595.04	282.232	401.8	281	46312.56	950.793	537.8	351	124434.00	2400.479	663.8
142	2867.48	55.448	287.6	212	14888.40	287.885	403.6	282	46870.24	965.837	539.6	352	125827.20	2428.804	665.6
143	2948.10	57.000	289.4	213	15184.50	293.626	405.4	283	47429.44	981.083	541.4	353	127225.60	2457.429	667.4
144	3031.64	58.622	291.2	214	15488.04	299.490	407.2	284	47989.84	996.537	543.2	354	128629.20	2486.354	669.2
145	3116.76	60.268	293.0	215	15792.80	305.383	409.0	285	48551.00	1012.193	545.0	355	130038.00	2515.579	671.0
146	3203.40	61.944	294.8	216	16104.40	311.408	410.8	286	49113.20	1028.057	546.8	356	131452.00	2545.004	672.8
147	3292.32	63.664	296.6	217	16422.56	317.524	412.6	287	49676.96	1044.129	548.6	357	132871.20	2574.729	674.6
148	3382.76	65.412	298.4	218	16742.04	323.758	414.4	288	50242.24	1060.317	550.4	358	134296.00	2604.754	676.4
149	3474.24	67.220	300.2	219	17067.32	330.023	416.2	289	50809.04	1076.614	552.2	359	135726.40	2635.079	678.2
150	3570.48	69.042	302.0	220	17395.64	336.377	418.0	290	51377.20	1093.120	554.0	360	137162.40	2665.704	680.0
151	3667.00	70.908	303.8	221	17726.56	342.812	419.8	291	51946.80	1109.833	555.8	361	138604.00	2696.629	681.8
152	3765.56	72.833	305.6	222	18060.80	349.316	421.6	292	52517.84	1126.753	557.6	362	140051.20	2727.854	683.6
153	3866.88	74.773	307.4	223	18397.84	355.893	423.4	293	53089.84	1143.883	559.4	363	141503.60	2759.379	685.4
154	3970.24	76.772	309.2	224	18746.68	362.538	425.2	294	53662.80	1161.120	561.2	364	142961.20	2791.204	687.2
155	4075.88	78.815	311.0	225	19123.12	369.261	427.0	295	54236.80	1178.563	563.0	365	144424.00	2823.429	689.0
156	4183.80	80.901	312.8	226	19502.60	376.032	428.8	296	54812.00	1196.213	564.8	366	145891.20	2855.954	690.8
157	4293.24	83.018	314.6	227	19884.52	382.815	430.6	297	55388.40	1214.063	566.6	367	147363.20	2888.779	692.6
158	4404.96	85.178	316.4	228	20268.80	389.620	432.4	298	55965.84	1232.120	568.4	368	148840.00	2921.904	694.4
159	4519.72	87.397	318.2	229	20655.76	396.496	434.2	299	56544.32	1250.383	570.2	369	150321.60	2955.329	696.2
160	4636.00	89.646	320.0	230	21045.28	403.434	436.0	300	57124.32	1268.853	572.0	370	151808.00	2989.054	698.0
161	4755.32	91.953	321.8	231	21437.20	410.434	437.8	301	57705.84	1287.528	573.8	371	153299.20	3023.079	699.8
162	4876.92	94.304	323.6	232	21831.04	417.496	439.6	302	58288.80	1306.398	575.6	372	154795.20	3057.404	701.6
163	5000.04	96.655	325.4	233	22226.80	424.620	441.4	303	58873.84	1325.463	577.4	373	156296.00	3092.029	703.4
164	5126.96	99.139	327.2	234	22624.00	431.807	443.2	304	59459.84	1344.733	579.2	374	157801.60	3126.954	705.2
165	5256.16	101.633	329.0	235	23023.20	439.058	445.0	305	60046.80	1364.208	581.0				
166	5388.58	104.165	330.8	236	23424.00	446.374	446.8	306	60634.80	1383.883	582.8				
167	5521.40	106.766	332.6	237	23826.40										

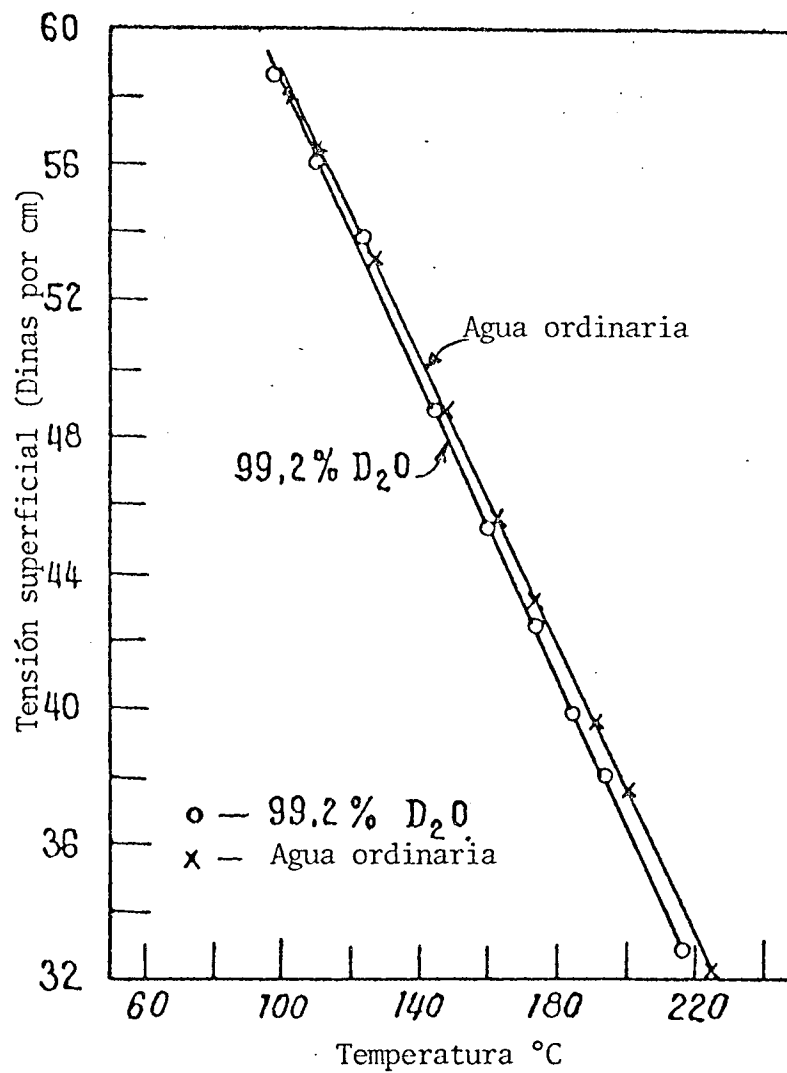
PUNTO DE EBULLICION DEL AGUA (ESCALA HIDROGENO)

P.	décimas de mm									P.	décimas de mm										
mm	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	mm	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
700	97.714	718	722	725	729	733	737	741	745	749	750	99.630	633	637	641	645	648	652	656	659	663
701	753	757	761	765	769	773	777	781	785	789	751	667	671	674	678	682	686	689	693	697	700
702	792	796	800	804	808	812	816	820	824	828	752	704	708	712	715	719	723	726	730	734	738
703	832	836	840	844	847	851	855	859	863	867	753	741	745	749	752	756	760	764	767	771	775
704	871	875	879	883	887	891	895	899	902	906	754	778	782	786	790	793	797	801	804	808	812
705	97.910	914	918	922	926	930	934	938	942	946	755	99.815	819	823	827	830	834	838	841	845	849
706	949	953	957	961	965	969	973	977	981	985	756	852	856	860	863	867	871	875	878	882	886
707	989	993	996	999	004	008	012	016	020	024	757	889	893	897	900	904	908	911	915	919	923
708	98.028	032	036	040	043	047	051	055	059	063	758	926	930	934	937	941	945	948	952	956	959
709	067	071	075	079	082	086	090	094	098	102	759	963	967	970	974	978	982	985	989	993	996
710	98.106	110	114	118	121	125	129	133	137	141	760	100.000	004	007	011	015	018	022	026	029	033
711	145	149	153	157	160	164	168	172	176	180	761	037	040	044	048	052	055	059	063	066	070
712	184	188	192	195	199	203	207	211	215	219	762	074	077	081	085	088	092	096	099	103	107
713	223	227	230	234	238	242	246	250	254	258	763	110	114	118	121	125	129	132	136	140	143
714	261	265	269	273	277	281	285	289	292	296	764	147	151	154	158	162	165	169	173	176	180
715	98.300	304	308	312	316	320	323	327	331	335	765	100.184	187	191	195	198	202	206	209	213	216
716	339	343	347	351	355	358	362	366	370	374	766	220	224	227	231	235	238	242	246	249	252
717	378	382	385	389	393	397	401	405	409	412	767	257	260	264	268	271	275	279	283	286	290
718	416	420	424	428	432	436	440	444	447	451	768	293	297	300	304	308	311	315	319	322	326
719	455	459	463	467	470	474	478	482	486	490	769	330	333	337	341	344	348	352	355	359	363
720	98.493	497	501	505	509	513	517	520	524	528	770	100.266	370	373	377	381	384	388	392	395	399
721	532	536	540	544	547	551	555	559	563	567	771	403	406	410	414	417	421	424	428	432	435
722	570	574	578	582	586	590	593	597	601	605	772	439	442	446	450	453	457	461	464	468	472
723	609	613	617	620	624	628	632	636	640	643	773	475	479	483	486	490	493	497	501	504	508
724	647	651	655	659	662	666	670	674	678	682	774	511	515	519	522	526	530	533	537	540	544
725	98.686	689	693	697	701	705	709	712	716	720	775	100.548	551	555	559	562	566	569	573	577	580
726	724	728	732	735	739	743	747	751	755	758	776	584	588	591	595	598	602	606	609	613	616
727	762	766	770	774	777	781	785	789	793	797	777	620	624	627	631	634	638	642	645	649	653
728	800	804	808	812	816	819	823	827	831	835	778	656	660	663	667	671	674	678	681	685	689
729	838	842	846	850	854	858	861	865	869	873	779	692	696	699	703	707	710	714	718	721	725
730	98.877	880	884	888	892	896	899	903	907	911	780	100.728	732	735	739	743	746	750	753	757	761
731	915	918	922	926	930	934	937	941	945	949	781	764	768	772	775	779	782	786	789	793	797
732	953	956	960	964	968	972	975	979	983	987	782	800	804	807	811	815	818	822	825	829	833
733	991	994	998	002	006	010	014	017	021	025	783	836	840	843	847	851	854	858	861	865	869
734	99.029	032	036	040	044	048	051	055	059	063	784	872	876	879	883	886	890	894	897	901	904
735	99.067	070	074	078	082	085	089	093	097	101	785	100.903	912	915	919	922	926	929	933	937	940
736	104	108	112	116	119	123	127	131	135	138	786	944	947	951	954	958	962	965	969	972	975
737	142	146	150	153	157	161	165	169	172	176	787	979	983	987	990	994	997	999	003	007	011
738	180	184	187	191	195	199	203	206	210	214	788	101.015	019	022	026	029	033	037	040	044	047
739	218	221	225	229	232	236	240	244	248	252	789	051	054	058	062	065	069	072	076	079	083
740	99.255	259	263	267	270	274	278	282	285	289	790	101.057	060	064	067	101	104	108	112	115	119
741	293	297	300	304	308	312	316	319	323	327	791	122	126	129	133	136	140	144	147	151	154
742	331	334	338	342	346	350	353	357	361	364	792	158	161	165	168	172	176	179	183	186	190
743	368	372	376	379	383	387	391	394	398	402	793	193	197	200	204	207	211	215	218	222	225
744	406	409	413	417	421	424	428	432	436	439	794	229	232	236	239	243	246	250	254	257	261
745	99.443	447	451	454	458	462	466	469	473	477	795	101.264	268	271	275	278	282	286	289	293	296
746	481	484	488	492	495	499	503	507	510	514	796	300	303	307	310	314	317	321	324	328	332
747	518	522	525	529	533	537	540	544	548	551	797	335	339	342	346	349	353	356	360	363	367
748	555	559	563	566	570	574	578	581	585	589	798	370	374	377	381	385	388	392	395	399	402
749	592	596	600	604	607	611	615	619	622	626	799	406	409	413	416	420	423	427	430	434	437
											800	101.441									

VARIACION DE LA TENSION SUPERFICIAL DEL D₂O CON LA TEMPERATURA

Temperatura °C	Tensión superficial del D ₂ O dinas/cm	Temperatura °C	Tensión superficial del D ₂ O dinas/cm
99,0	58,5	174,6	42,4
110,8	56,0	184,8	39,9
124,0	53,8	193,8	38,0
145,6	48,7	216,0	32,8
160,8	45,3	-----	----

13-p.11



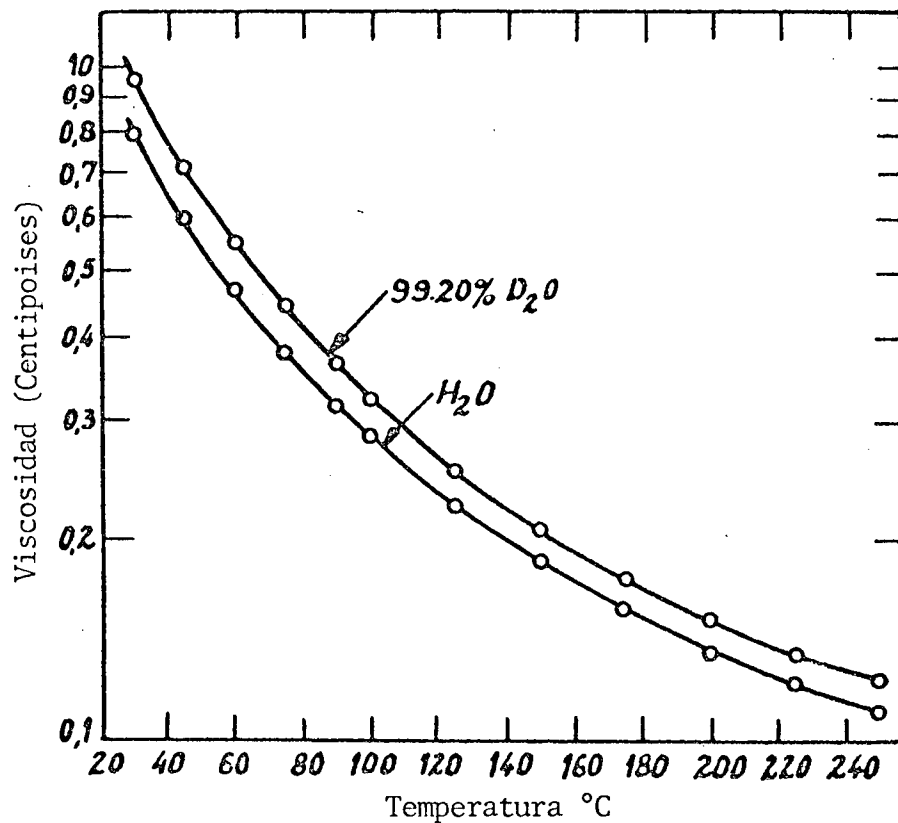
Variación de la tensión superficial del D₂O con la temperatura.

13-p.11

VISCOSIDAD ABSOLUTA DEL D_2O Y AGUA LIVIANA (EN CENTIPOISE)

Temperatura °C	Agua liviana	Agua pesada 99,56 %	Valores extrapolados 100 %
5	1,5230	1,9858	1,9878
20	1,0050	1,2503	1,2514
40	0,6551	0,7866	0,7872
60	0,4679	0,5509	0,5513
80	0,3558	0,4138	0,4141
95	0,2985	0,3452	0,3454

13-p.12



Viscosidad del D_2O y H_2O en función de la temperatura.

13-p.13

RELACION DE VISCOSIDADES D_2O/H_2O

Temperatura	D_2O a 99,56%	D_2O a 100%
5	1,3038	1,3052
20	1,2441	1,2452
40	1,2008	1,2017
60	1,1774	1,1782
80	1,1630	1,1637
95	1,1563	1,1570

13-p.12

VISCOSIDAD DEL D_2O (99,2%), N_{D_2O}

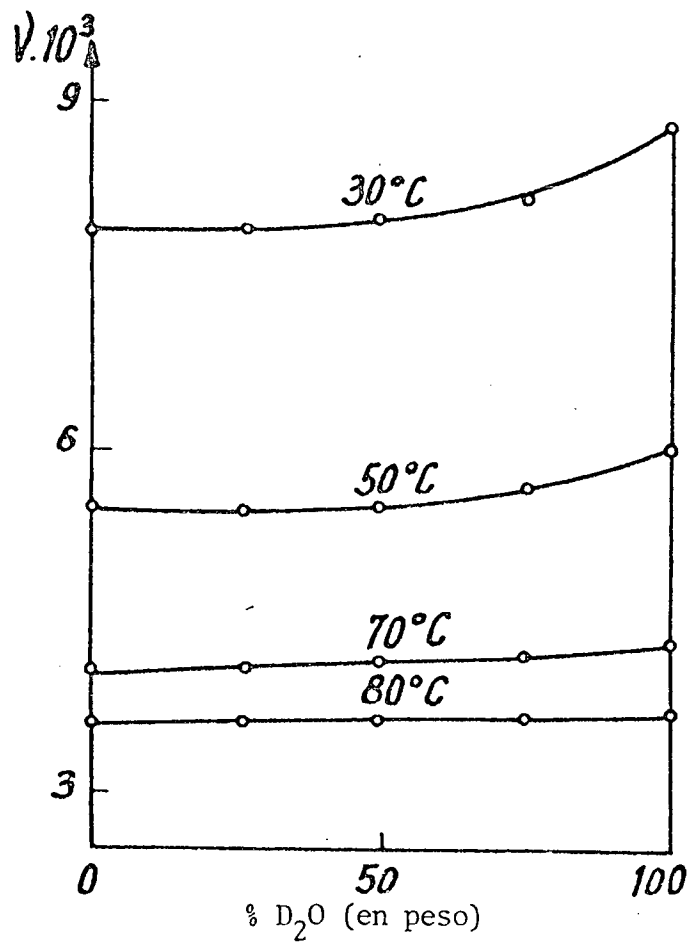
Temp.	$\frac{N_{D_2O}}{N_{H_2O}}$	N_{D_2O}
30	1,21	0,969
45	1,19	0,713
60	1,18	0,552
75	1,17	0,445
90	1,15	0,365
100	1,14	0,323
125	1,13	0,252
150	1,12	0,208
175	1,11	0,175
200	1,11	0,151
225	1,10	0,135
250	1,10	0,124

13-p.12

VISCOSIDAD CINEMATICA ν (EN CENTI-STOKES)

T °C	$\nu \cdot 10^5$
25,5	1004
32,0	842
45,4	654
51,0	591
63,0	491
84,6	344

13-p.14



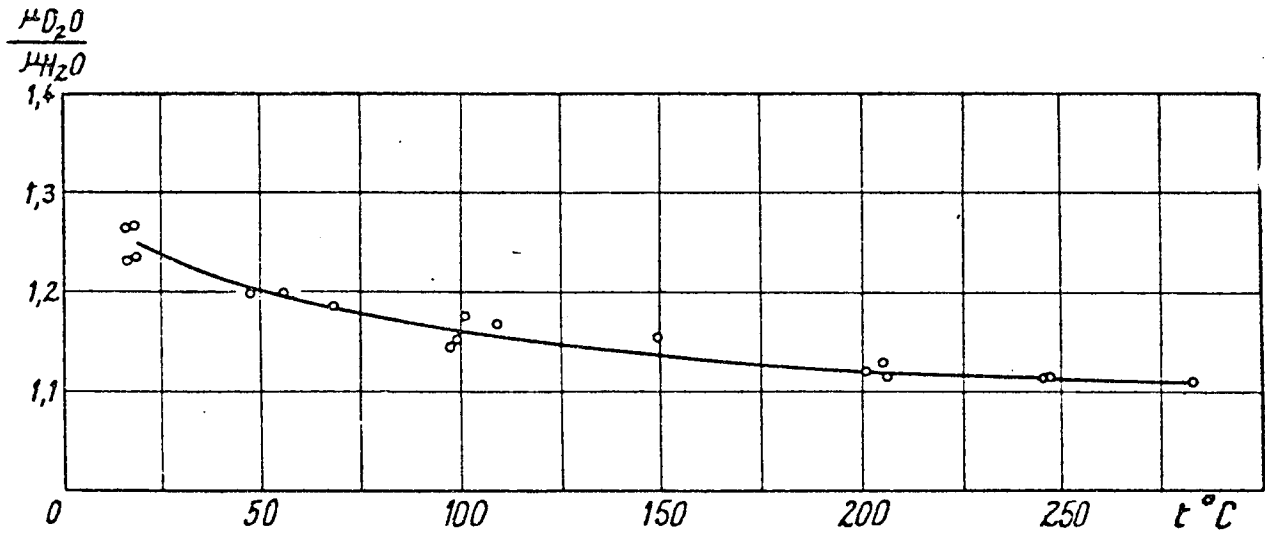
Viscosidad cinemática (en centi- stokes)

13-p.14

VALORES MEDIOS DE LA VISCOSIDAD DEL D₂O A LAS PRESIONES DE SATURACION

T °C	$\mu_{D_2O} \cdot 10^5$ (en kg/seg /m ²)	$\frac{\mu_{D_2O}}{\mu_{H_2O}}$	T °C	$\mu_{D_2O} \cdot 10^6$ (en kg/seg /m ²)	$\frac{\mu_{D_2O}}{\mu_{H_2O}}$
15	140,5	1,258	150	21,6	1,137
20	127,7	1,247	160	20,0	1,133
30	103,3	1,228	170	18,8	1,130
40	80,7	1,212	180	17,6	1,128
50	67,1	1,199	190	16,5	1,125
60	56,9	1,188	200	15,6	1,123
70	48,8	1,179	210	14,9	1,122
80	42,4	1,172	220	14,2	1,119
90	37,4	1,165	230	13,6	1,118
100	33,4	1,159	240	13,1	1,117
110	30,4	1,153	250	12,5	1,115
120	27,8	1,148	260	12,0	1,113
130	25,4	1,143	270	11,5	1,110
140	23,4	1,139	280	11,1	1,109

13-p.15



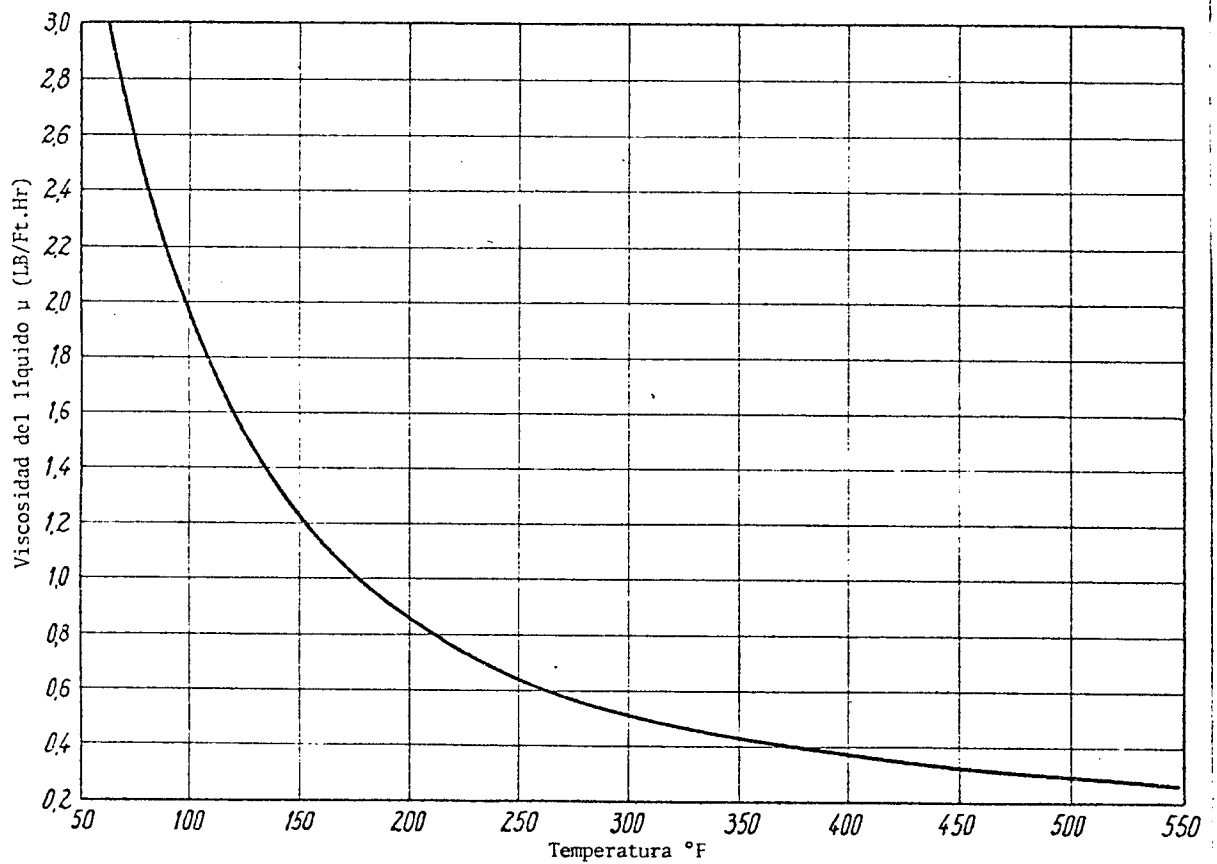
Relaciones de viscosidad de H₂O y D₂O

13-p.15

RELACIONES DE VISCOSIDADES DE LOS
VAPORES DEL D_2O Y H_2O

T (°K)	
353	1.05 ₁
373	1.06 ₆
405	1.07 ₄

13-p.16



Viscosidad del D_2O a la presión de saturación

13-p.13

VISCOSIDADES DE LOS VAPORES DEL H₂O Y D₂O
A LA PRESION ATMOSFERICA (EN μ POISES)

T (°C)	μ H ₂ O	μ D ₂ O
0	88,4 ^b	----
50	106,4 ^b	----
100	124,5 ^b	----
150	142,5 ^b	----
200	157,9	161,6
250	176,5	180,9
300	195,4	201,0
400	234,4	241,5
500	273,2	282,2
600	313,1	321,9
700	351,5	360,7
800	388,5	397,5
900	424,9	432,4
1000	460,0	466,0
1100	490,3	496,2
1200	517,4	523,1
1300	542,1	546,5
1400	564,1	569,6
1500	584,5	590,2
1600	606,1 ^c	611,4 ^d
1700	626,0 ^c	631,8 ^d
1800	645,3 ^c	651,4 ^d

13-p.16

Nota:

Los valores obedecen a las relaciones:

$$(b) \quad \mu = 88,4 + 0,361 \, t$$

$$(c) \quad \mu = \frac{T^{5/2}}{16360 + 0,066756 \, T^2}$$

$$(d) \quad \mu = \frac{T^{5/2}}{17062 + 0,065926 \, T^2}$$

VISCOSIDAD DEL AGUA PESADA 100%

t, °C	5	10	15	20	25	30	35
μ_{D_2O}/μ_{H_2O}	1.309	1.286	1.267	1.249	1.232	1.215	1.198
μ_{H_2O}, cp	1.519	1.310	1.145	1.009	0.895	0.800	0.721
μ_{D_2O}, cp	1.988	1.685	1.451	1.268	1.103	0.972	0.864

15-p.111

VISCOSIDAD DE SOLUCIONES DE H_2O - D_2O a 25°C

d_{25}^{25}	$\frac{d_c}{d_0}$	$t_c, \text{seg.}$	$t_0, \text{seg.}$	$\frac{t_c d_c}{t_0 d_0}$	Por energ. cinética	μ_{rel}
0.99998 ₂	0.99998 ₂	539.00	539.01	0.99996	0.00000	0.99996
1.00061	1.00061	533.88	533.50	1.00132	0.00000	1.00132
1.02368	1.02371	547.12	533.73	1.04939	0.00029	1.04968
1.04591	1.04597	559.46	533.70	1.09647	0.00056	1.09703
1.05783	1.05790	566.26	533.99	1.12184	0.00071	1.12255
1.07556	1.07565	575.33	533.56	1.15986	0.00092	1.16078
1.08903	1.08913	582.23	533.50	1.18860	0.00109	1.18969
1.10495	1.10508	590.35	533.63	1.22253	0.00127	1.22380

15-p.112

VISCOSIDAD DE MEZCLAS H_2O - D_2O REFERIDAS A LA VISCOSIDAD DE AGUA PURA A 25°C

N_{D_2O}	$\mu_{\text{sol}}/\mu_{H_2O}$	N_{D_2O}	$\mu_{\text{sol}}/\mu_{H_2O}$
0.000	1.000	0.709	1.161
0.206	1.046	0.848	1.195
0.368	1.082	0.980	1.226
0.550	1.123	1.000	(1.232)

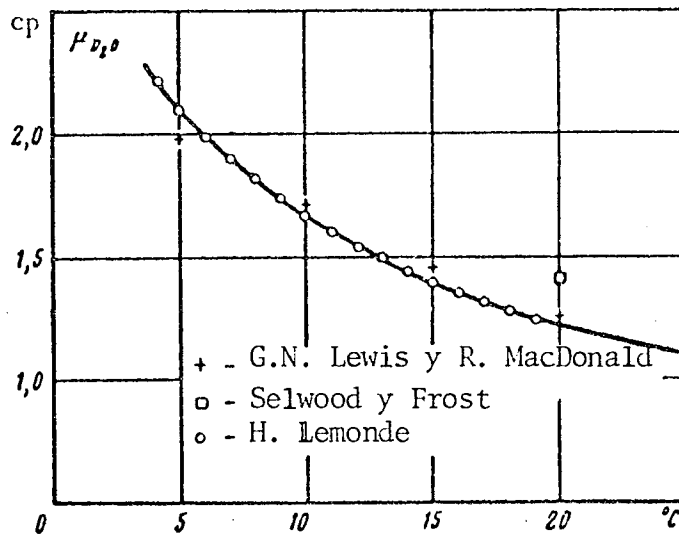
15-p.112

VISCOSIDAD DEL D₂O 99,65%

t, °C	μ , cP	t, °C	μ , cP	t, °C	μ , cP
4	2.25*	10	1.67	16	1.37
5	2.10	11	1.61	17	1.33
6	1.99	12	1.56	18	1.29*
7	1.90	13	1.51	19	1.25*
8	1.81	14	1.46	20	1.22*
9	1.73	15	1.41		

* Valores obtenidos por extrapolación

15-p.113



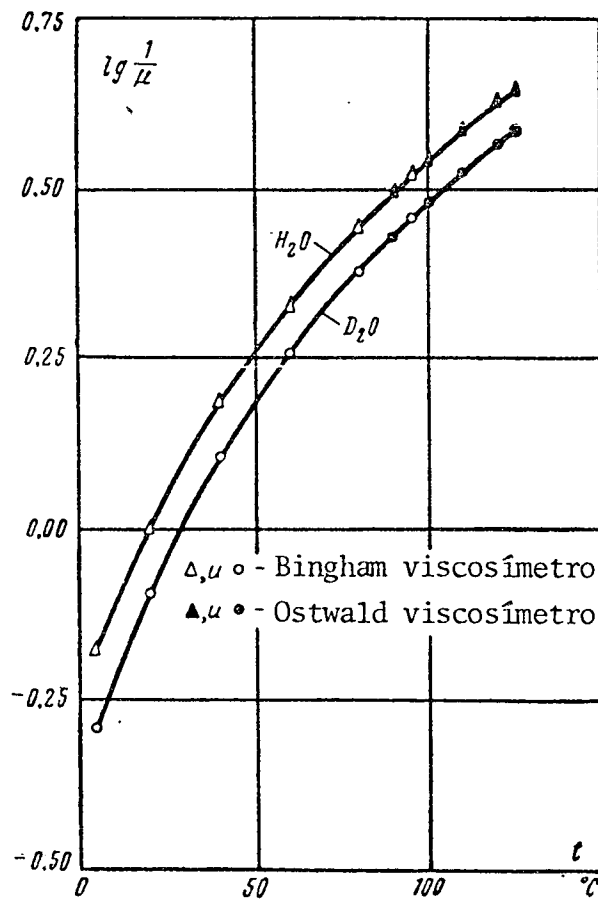
Viscosidad del agua pesada.

15-p.114

VISCOSIDAD EXPERIMENTAL DEL AGUA PESADA Y COMUN

$\tau, ^\circ\text{C}$	$\mu_{\text{H}_2\text{O}}, \text{cp}$	$\mu_{\text{D}_2\text{O}}, \text{cp}$	$\mu_{\text{D}_2\text{O}} / \mu_{\text{H}_2\text{O}}$
5	1.5230	1.9878	1.3052
20	1.0050	1.2514	1.2452
40	0.6551	0.7872	1.2017
60	0.4679	0.5513	1.1782
80	0.3558	0.4141	1.1637
90	0.3158	0.3658	1.1583
95	0.2985	0.3454	1.1570
100	0.2830	0.3265	1.1538
110	0.2557	0.2941	1.1504
120	0.2328	0.2669	1.1467
125	0.2227	0.2551	1.1456

15-p.115,



Viscosidades experimentales del agua pesada y liviana.

15-p.116

VISCOSIDAD EXPERIMENTAL DEL AGUA PESADA

$t, ^\circ\text{C}$	$\rho,$ kg/cm ³	$\rho,$ kg·seg ² /m ⁴	$G_1,$ g	$\tau,$ seg/mm	$G_2^*,$ g	$\tau_2,$ seg/mm	$\nu \cdot 10^8,$ m ² /seg	$\mu_{\text{D}_2\text{O}} \cdot 10^6,$ kg·seg/m ²	$\mu_{\text{H}_2\text{O}} \cdot 10^6,$ kg·seg/m ²	$\mu_{\text{D}_2\text{O}}/\mu_{\text{H}_2\text{O}}$
15.2	46.0	113.0	400	8.84	200	17.94	130	147	117	1.256
16.0	47.5	113.0	100	36.88	50	80.00	128	144	114	1.263
16.5	47.9	113.0	400	8.50	200	17.52	123	139	113	1.230
18.1	97.2	113.2	200	15.68	100	30.27	122	138	109	1.266
18.3	97.5	113.2	400	7.78	200	15.46	117	132	107	1.234
18.3	97.5	113.2	200	15.48	100	30.32	118	134	107	1.252
18.8	99.0	113.2	200	15.32	100	29.86	118	134	103	1.264
19.1	55.0	113.0	400	7.88	200	16.18	115	130	105	1.238
19.2	51.5	113.1	400	7.62	200	15.17	114	130	105	1.238
20.6	57.0	113.0	400	7.38	200	14.70	110	125	101	1.238
47.4	70.8	113.1	200	8.45	100	16.92	62.4	70.6	59.0	1.197
56.0	75.8	112.0	200	7.69	100	15.97	54.9	61.5	51.3	1.199
68.3	89.7	111.2	200	5.95	100	11.43	45.5	50.6	42.7	1.185
96.9	100.0	109.2	100	8.34	50	16.26	31.4	34.3	30.0	1.143
98.7	103.1	109.1	100	8.51	50	17.11	31.0	33.8	29.4	1.150
101.0	120.0	109.0	100	8.75	50	18.23	30.9	33.7	28.7	1.174
109.2	100.0	108.2	150	4.92	75	9.16	29.0	31.4	26.9	1.167
148.7	86.0	104.3	80	7.10	40	13.53	21.5	22.4	19.4	1.155
201.2	111.2	93.3	80	5.38	40	10.10	16.0	15.7	14.0	1.121
205.3	242.0	99.8	80	6.14	40	13.20	16.1	15.9	14.1	1.128
206.4	53.6	97.1	80	6.00	40	12.94	15.6	15.2	13.6	1.118
246.7	321.8	93.7	80	5.44	40	11.30	14.4	13.5	12.1	1.116
247.2	325.0	93.6	80	5.43	40	11.30	14.4	13.5	12.1	1.116
288.0	111.5	84.7	60	5.85	30	10.71	13.2	11.2	10.1	1.109

15-p.119

DATOS EXPERIMENTALES DE VISCOSIDAD DEL D₂O VAPOR

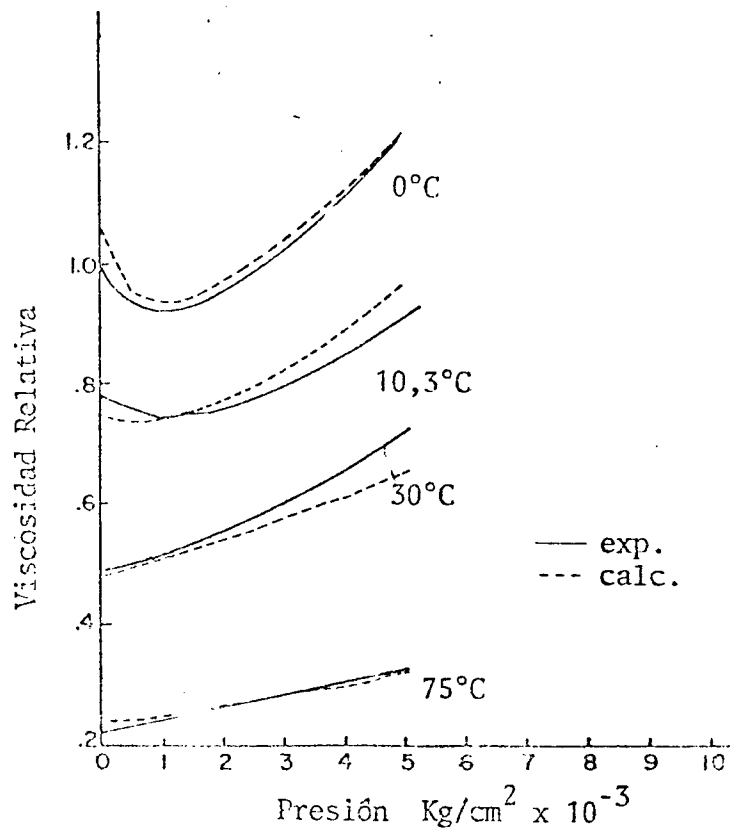
$t, ^\circ\text{C}$	$\mu,$ micro- cp	$t, ^\circ\text{C}$	$\mu,$ micro- cp	$t, ^\circ\text{C}$	$\mu,$ micro- cp
200	161.6	700	360.7	1300	546.5
250	180.9	800	397.5	1400	569.6
300	201.0	900	432.4	1500	590.2
400	241.5	1000	466.0	1600	611.4
500	282.2	1100	496.2	1700	631.8
600	321.9	1200	523.1	1800	651.4

15-p.122

VALORES DE VISCOSIDAD DEL D₂O
A LA PRESION DE SATURACION

$t, ^\circ\text{C}$	$\mu_{\text{D}_2\text{O}} \cdot 10^3$, Kg. seg/m ²	$\mu_{\text{D}_2\text{O}}/\mu_{\text{H}_2\text{O}}$	$t, ^\circ\text{C}$	$\mu_{\text{D}_2\text{O}} \cdot 10^3$, kg. seg/m ²	$\mu_{\text{D}_2\text{O}}/\mu_{\text{H}_2\text{O}}$
15	140.5	1.258	150	21.6	1.137
20	127.7	1.247	160	20.0	1.133
30	103.3	1.228	170	18.8	1.130
40	80.7	1.212	180	17.6	1.128
50	67.1	1.199	190	16.5	1.125
60	56.9	1.188	200	15.6	1.123
70	48.8	1.179	210	14.9	1.122
80	42.4	1.172	220	14.2	1.119
90	37.4	1.165	230	13.6	1.118
100	33.4	1.159	240	13.1	1.117
110	30.4	1.153	250	12.5	1.115
120	27.8	1.148	260	12.0	1.113
130	25.4	1.143	270	11.5	1.110
140	23.4	1.139	280	11.1	1.109

15-p. 120

Viscosidad relativa del H₂O.

6-p. 1469

VISCOSIDAD DEL AGUA

$t, ^\circ\text{C}$	H_2^{18}O			D_2^{16}O			
	$\eta_{\text{ext}}, \text{cP}$	$\eta_{\text{lit}}, \text{cP}$	$\Delta\%$	$\eta(1), \text{cP}$	$\eta(2), \text{cP}$	$\eta_{\text{calcd}}(2), \text{cP}$	$\Delta\%$
15	1.138 ₅	1.139	-0.04	1.4764	1.4732	1.4595	-0.92
20	1.0024	1.0020	+0.04	1.2898	1.2797	1.2754	-0.34
25	0.8907	0.8904	+0.03	1.1245	1.1250	1.1132	-1.04
30	0.7975	0.7975	0.00	0.9974	0.9945	0.9879	-0.66
35	0.7191	0.7194	-0.04	0.8929	0.8897	0.8846	-0.57

17-p.273

VISCOSIDAD DEL D_2^{18}O

$t, ^\circ\text{C}$	$\rho, \text{g cm}^{-3}$		
	(muestra 1)	(muestra 2)	100% D_2^{18}O
15	1.202798	1.195212	1.216786
20	1.202203	1.194598	1.216223
25	1.201216	1.193599	1.215256
30	1.199879	1.192253	1.213930
35	1.198226	1.190598	1.212282

17-p.273

VISCOSIDAD DE ESPECIES ISOTOPICAS DEL AGUA

$t, ^\circ\text{C}$	η, cP				
	D_2^{18}O	D_2^{16}O	H_2^{18}O	H_2^{17}O	H_2^{16}O
15	1.5057	1.4347	1.2008	1.1633	1.139
20	1.3150	1.2471	1.0564	1.0246	1.0020
25	1.1441	1.0966	0.9381	0.9105	0.8904
30	1.0140	0.9732	0.8400	0.8153	0.7975
35	0.9072	0.8710	0.7568	0.7353	0.7194

17-p.274

VISCOSIDADES DE MEZCLAS DE $H_2^{16}O$ - $D_2^{16}O$ A 25° C

$N_{D_2^{16}O}$	$\eta_m/\eta(H_2^{16}O)$	$\eta_{\text{expt}}, \text{ cP}$	$\eta_{\text{calcd}},^a \text{ cP}$	$\Delta\%$	$\eta_{\text{calcd}},^b \text{ cP}$	$\Delta\%$
0.206	1.046	0.9314	0.9294	-0.21	0.9263	-0.55
0.368	1.082	0.9634	0.9613	-0.23	0.9566	-0.71
0.550	1.123	0.9999	0.9985	-0.14	0.9931	-0.68
0.709	1.161	1.0338	1.0321	-0.16	1.0274	-0.62
0.848	1.195	1.0640	1.0624	-0.15	1.0593	-0.44
0.980	1.226	1.0916	1.0920	+0.04	1.0915	-0.01
0.0059	1.00132	0.8916	0.8915	-0.01	0.8914	-0.02
0.2216	1.04968	0.9346	0.9325	-0.22	0.9291	-0.59
0.4285	1.09703	0.9768	0.9735	-0.34	0.9684	-0.86
0.5390	1.12255	0.9995	0.9962	-0.33	0.9908	-0.87
0.7028	1.16078	1.0336	1.0308	-0.27	1.0260	-0.74
0.8268	1.18969	1.0593	1.0577	-0.15	1.0543	-0.47
0.9730	1.22380	1.0897	1.0904	+0.06	1.0898	+0.01

^a $\eta_m = (hN/\bar{V}_m) \exp[\sum N_i \Delta G_i^f/RT]$. ^b $\eta_m = 1/\sum N_i/\eta_i$.

17-p.274

RELACION DE VISCOSIDADES DE ESPECIES ISOTOPICAS PURAS DEL D_2O

$t, ^\circ\text{C}$	$\eta(D_2^{18}O)/\eta(H_2^{16}O)$	$\eta(D_2^{16}O)/\eta(H_2^{16}O)$	$\eta(H_2^{18}O)/\eta(H_2^{16}O)$	$\eta(H_2^{17}O)/\eta(H_2^{16}O)$	$\eta(D_2^{17}O)/\eta(H_2^{16}O)^c$
15	1.3220	1.2596	1.0543	1.0213	1.28
20	1.3124	1.2446	1.0543	1.0226	1.27
25	1.2849	1.2316	1.0536	1.0226	1.25
30	1.2714	1.2203	1.0520	1.0223	1.24
35	1.2611	1.2107	1.0520	1.0221	1.23

(a) aproximando $\eta_{\text{rel}}(D_2^{17}O) = 1 + [\eta_{\text{rel}}(D_2^{16}O) - 1] + [\eta_{\text{rel}}(H_2^{17}O) - 1]$.

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η Viscosidad del D₂O : Dekapoise . $10^6 = \text{Ns/m}^2 \cdot 10^6$

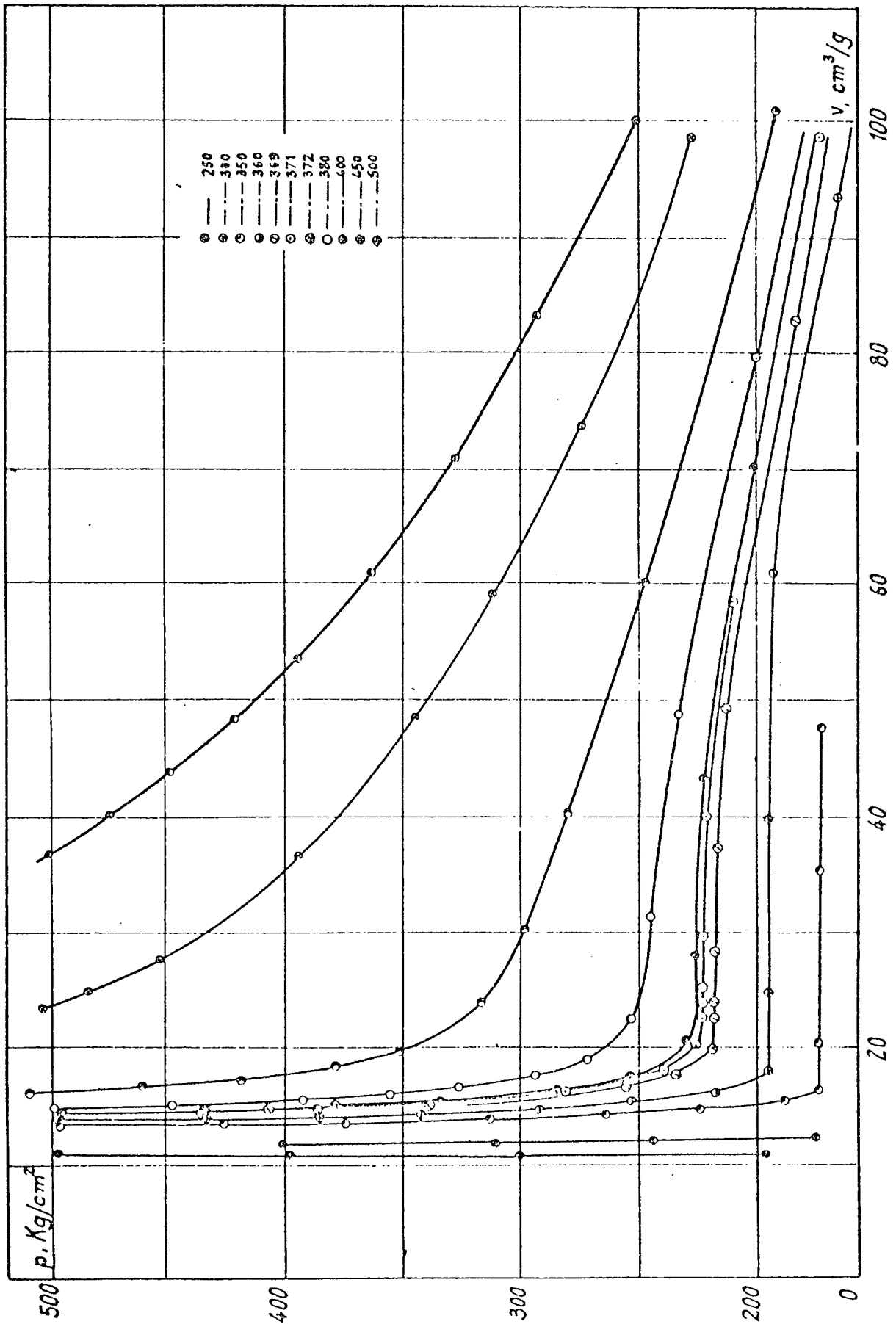
°C	0	1	2	3	4	5	6	7	8	9
10	1412.7	1423.0	1422.3	1413.6	1398.9	1379.8	1357.7	1333.4	1307.6	1280.9
20	1233.7	1225.3	1199.0	1172.0	1145.3	1119.2	1093.6	1068.5	1044.2	1020.5
30	957.4	975.1	953.4	932.4	912.0	892.3	873.2	854.7	836.8	819.5
40	802.7	786.5	770.7	755.5	740.7	726.4	712.6	699.2	686.1	673.5
50	661.3	649.4	637.9	626.7	615.8	605.3	595.1	585.1	575.4	566.0
60	556.9	548.0	538.4	530.9	522.8	514.8	507.0	499.4	492.1	484.9
70	477.9	471.1	464.4	457.9	451.6	445.4	439.4	433.5	427.7	422.1
80	416.6	411.3	406.0	400.9	395.9	391.0	386.2	381.5	376.9	372.5
90	368.1	363.8	359.6	355.4	351.4	347.4	343.6	339.3	336.1	332.4
100	328.8	325.3	321.9	318.5	315.2	312.0	308.8	305.7	302.6	299.5
110	296.6	293.7	290.9	288.1	285.3	282.6	280.0	277.4	274.8	272.3
120	269.8	267.4	265.0	262.6	260.3	258.0	255.8	253.6	251.4	249.3
130	247.2	245.1	243.1	241.1	239.1	237.2	235.3	233.4	231.6	229.7
140	227.9	226.2	224.4	222.7	221.0	219.3	217.7	216.1	214.5	212.9
150	211.3	209.8	208.3	206.8	205.3	203.9	202.5	201.1	199.7	198.3
160	196.9	195.6	194.3	193.0	191.7	190.4	189.2	187.9	186.7	185.5
170	184.3	183.2	182.0	180.9	179.7	178.6	177.5	176.4	175.3	174.3
180	173.2	172.2	171.2	170.2	169.2	168.2	167.2	166.2	165.3	164.3
190	163.4	162.5	161.5	160.7	159.8	158.9	158.0	157.1	156.3	155.4
200	154.6	153.8	153.0	152.2	151.4	150.6	149.8	149.0	148.3	147.5
210	146.8	146.0	145.3	144.5	143.8	143.1	142.4	141.7	141.0	140.3
220	139.7	139.0	138.3	137.7	137.0	136.4	135.8	135.1	134.5	133.9
230	133.3	132.7	132.1	131.5	130.9	130.3	129.7	129.1	128.6	128.0
240	127.5	126.9	126.4	125.8	125.3	124.7	124.2	123.7	123.2	122.7
250	122.2	121.6	121.1	120.7	120.2	119.7	119.2	118.7	118.2	117.8
260	117.3	116.8	116.4	115.9	115.5	115.0	114.6	114.2	113.7	113.3
270	112.9	112.4	112.0	111.6	111.2	110.8	110.4	110.0	109.6	109.2
280	108.8									

VALORES EXPERIMENTALES DE VOLUMENES ESPECIFICOS DEL D₂O

250° C		300° C		350° C		360° C	
$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$	$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$	$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$	$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$
81.87	1.123	86.64	19.21	89.38	24.02	74.29	31.11
194.87	1.106	88.71	4.092	147.61	11.12	135.68	13.88
300.03	1.092	88.67	2.412	171.62	4.784	167.66	9.392
397.57	1.081	88.72	1.618	171.66	3.553	191.88	6.113
497.25	1.070	103.78	1.268	171.80	2.060	193.90	4.005
—	—	173.16	1.243	171.80	1.647	193.92	2.501
—	—	242.28	1.223	186.63	1.560	193.93	1.822
—	—	310.33	1.205	222.30	1.498	216.07	1.645
—	—	400.41	1.185	262.28	1.451	251.64	1.559
—	—	—	—	312.37	1.409	291.23	1.501
—	—	—	—	374.03	1.370	341.92	1.449
—	—	—	—	425.96	1.343	384.90	1.416
—	—	—	—	496.75	1.313	432.82	1.386
—	—	—	—	—	—	496.43	1.353

369° C		371° C		372° C		380° C	
$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$	$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$	$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$	$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$
77.87	30.14	120.84	17.42	93.94	24.24	91.37	25.68
126.25	16.21	171.85	9.912	152.19	12.40	143.14	14.23
184.76	8.306	209.38	5.869	199.95	7.047	198.71	7.980
212.61	4.946	220.24	4.019	221.33	4.338	232.12	4.889
215.70	3.742	221.42	2.976	224.14	2.819	244.06	3.140
216.13	2.858	221.46	2.542	227.25	2.089	251.82	2.270
216.36	2.416	221.56	2.405	252.15	1.774	270.63	1.918
216.40	2.277	221.62	2.289	282.64	1.659	292.49	1.781
217.69	2.012	223.81	2.051	332.97	1.561	325.95	1.673
233.08	1.794	237.69	1.834	378.14	1.505	354.94	1.612
254.03	1.683	280.35	1.648	433.30	1.453	391.66	1.558
296.88	1.585	330.89	1.551	496.54	1.412	447.36	1.497
338.28	1.523	406.33	1.468	—	—	497.95	1.455
385.75	1.473	496.27	1.405	—	—	—	—
436.16	1.433	—	—	—	—	—	—
498.64	1.393	—	—	—	—	—	—

400° C		450° C		500° C	
$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$	$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$	$\rho, \text{kg/cm}^2$	$\nu, \text{cm}^3/\text{g}$
91.87	26.91	91.17	30.37	83.12	36.80
142.24	15.58	138.21	18.81	149.74	19.23
190.19	10.13	172.81	14.27	201.73	13.52
246.46	6.030	226.64	9.884	250.27	10.31
279.40	4.034	274.08	7.382	293.13	8.334
297.71	3.031	314.01	5.826	328.61	7.090
316.39	2.410	345.15	4.848	364.07	6.091
351.38	1.992	394.29	3.651	395.86	5.350
378.03	1.855	452.41	2.754	422.01	4.832
418.64	1.730	482.81	2.469	449.34	4.363
460.14	1.649	504.02	2.322	474.53	3.989
509.32	1.582	—	—	500.74	3.652



Variaciones del volumen específico del D_2O con la presión

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VOLUMENES ESPECIFICOS DEL D₂O (cm³/g)

Temperatura (°C)	250	260	270	280	290	300	310	320	330	340	350	360	369	370	371	372
Presión (Kg/cm ²)																
50	1,1276	1,1570	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	1,1261	1,1552	1,1858	-	-	-	-	-	-	-	-	-	-	-	-	-
70	1,1246	1,1534	1,1838	1,2161	-	-	-	-	-	-	-	-	-	-	-	-
80	1,1230	1,1516	1,1815	1,2136	1,2487	-	-	-	-	-	-	-	-	-	-	-
90	1,1215	1,1498	1,1794	1,2110	1,2456	1,2845	-	-	-	-	-	-	-	-	-	-
100	1,1200	1,1480	1,1774	1,2085	1,2425	1,2806	-	-	-	-	-	-	-	-	-	-
125	1,1163	1,1437	1,1723	1,2025	1,2351	1,2714	1,3132	1,3637	-	-	-	-	-	-	-	-
150	1,1127	1,1395	1,1674	1,1966	1,2281	1,2626	1,3021	1,3489	1,4079	-	-	-	-	-	-	-
200	1,1057	1,1315	1,1580	1,1856	1,2149	1,2465	1,2819	1,3228	1,3723	1,4358	1,5227	1,6514	-	-	-	-
250	1,0991	1,1238	1,1492	1,1753	1,2027	1,2320	1,2641	1,3003	1,3429	1,3955	1,4636	1,5570	-	-	-	-
300	1,0927	1,1166	1,1409	1,1657	1,1916	1,2188	1,2482	1,2808	1,3182	1,3630	1,4187	1,4910	1,5776	1,5929	-	-
350	1,0866	1,1097	1,1331	1,1568	1,1812	1,2067	1,2340	1,2637	1,2972	1,3363	1,3835	1,4424	1,5097	1,5183	1,5270	1,5630
400	1,0807	1,1031	1,1256	1,1484	1,1717	1,1957	1,2212	1,2486	1,2791	1,3139	1,3551	1,4050	1,4594	1,4673	1,4742	1,4814
450	1,0751	1,0969	1,1186	1,1405	1,1628	1,1856	1,2097	1,2352	1,2633	1,2949	1,3317	1,3754	1,4227	1,4286	1,4344	1,4404
500	1,0701	1,0909	1,1120	1,1331	1,1545	1,1763	1,1991	1,2232	1,2494	1,2786	1,3121	1,3513	1,3931	1,3982	1,4033	1,4085
550	1,0646	1,0852	1,1057	1,1261	1,1467	1,1677	1,1895	1,2124	1,2371	1,2645	1,2955	1,3314	1,3692	1,3739	1,3784	1,3830
600	1,0596	1,0797	1,0997	1,1195	1,1395	1,1597	1,1807	1,2026	1,2261	1,2520	1,2812	1,3147	1,3495	1,3538	1,3579	1,3622
650	1,0548	1,0745	1,0940	1,1133	1,1327	1,1523	1,1726	1,1936	1,2163	1,2411	1,2688	1,3004	1,3330	1,3370	1,3409	1,3448
700	1,0502	1,0694	1,0885	1,1074	1,1263	1,1454	1,1651	1,1855	1,2074	1,2313	1,2579	1,2880	1,3190	1,3228	1,3264	1,3301
750	1,0457	1,0646	1,0833	1,1018	1,1203	1,1389	1,1581	1,1780	1,1993	1,2225	1,2483	1,2772	1,3069	1,3105	1,3140	1,3176
800	1,0414	1,0600	1,0784	1,0965	1,1146	1,1329	1,1517	1,1712	1,1920	1,2146	1,2397	1,2678	1,2964	1,2999	1,3032	1,3066
850	1,0373	1,0556	1,0736	1,0914	1,1092	1,1272	1,1457	1,1648	1,1853	1,2075	1,2320	1,2594	1,2872	1,2906	1,2938	1,2971
900	1,0333	1,0513	1,0691	1,0866	1,1042	1,1218	1,1401	1,1589	1,1791	1,2009	1,2251	1,2519	1,2790	1,2823	1,2855	1,2887
950	1,0294	1,0472	1,0647	1,0820	1,0994	1,1168	1,1348	1,1535	1,1734	1,1950	1,2188	1,2452	1,2717	1,2750	1,2780	1,2812
1000	1,0257	1,0432	1,0606	1,0776	1,0948	1,1121	1,2299	1,1484	1,1681	1,1895	1,2130	1,2391	1,2652	1,2684	1,2714	1,2745

VOLUMEN ESPECIFICO DEL AGUA PESADA (99,87% D₂O)

$t, ^\circ\text{C}$ $\rho, \text{kg/cm}^3$	275	300	325	340	350	360	365	370	375	380	390	400	410	420	425
50	—	41.726	43.446	46.603	47.740	48.847	49.400	49.945	50.487	51.020	52.067	53.095	54.139	55.160	55.670
60	—	33.347	36.215	37.817	38.833	39.820	40.311	40.790	41.264	41.738	42.655	43.552	44.452	45.341	45.779
70	1.1909	27.214	29.987	31.493	32.433	33.341	33.789	34.224	34.652	35.084	35.912	36.716	37.523	38.313	38.703
80	1.1885	22.431	25.249	26.699	27.596	28.452	28.869	29.274	29.666	30.069	30.836	31.574	32.311	33.030	33.384
90	1.1861	1.2740	21.488	22.922	23.793	24.617	25.014	25.397	25.770	26.146	26.869	27.560	28.246	28.912	29.236
100	1.1837	1.2700	18.398	19.845	20.711	21.516	21.895	22.274	22.630	22.986	23.677	24.337	24.981	25.607	25.910
110	1.1813	1.2661	15.748	17.268	18.144	18.944	19.315	19.685	20.034	20.383	21.050	21.687	22.298	22.897	23.182
120	1.1792	1.2621	13.381	15.052	15.958	16.766	17.133	17.506	17.849	18.191	18.843	19.463	20.051	20.627	20.901
130	1.1769	1.2582	1.3881	13.093	14.052	14.884	15.260	15.632	15.981	16.316	16.961	17.568	18.140	18.696	18.963
140	1.1747	1.2544	1.3803	11.293	12.352	13.228	13.617	13.996	14.348	14.687	15.331	15.930	16.490	17.034	17.296
150-	1.1726	1.2508	1.3729	—	10.797	11.750	12.156	12.549	12.907	13.254	13.900	14.496	15.050	15.584	15.842
160	1.1705	1.2473	1.3661	1.4968	9.312	10.387	10.836	11.246	11.617	11.975	12.628	13.226	13.780	14.306	14.563
170	1.1686	1.2442	1.3635	1.4723	7.765	9.103	9.609	10.053	10.448	10.817	11.488	12.094	12.650	13.170	13.428
180	1.1666	1.2412	1.3537	1.4594	1.5803	7.842	8.436	8.941	9.365	9.759	10.459	11.072	11.634	12.153	12.410
190	1.1644	1.2378	1.3473	1.4476	1.5564	—	7.256	7.854	8.348	8.773	9.517	10.142	10.712	11.233	11.492
200	1.1625	1.2344	1.3414	1.4372	1.5361	1.7289	—	6.798	7.370	7.844	8.641	9.292	9.872	10.399	10.655
210	1.1608	1.2314	1.3360	1.4273	1.5186	1.6773	1.8536	5.618	6.386	6.944	7.815	8.505	9.101	9.638	9.891
220	1.1589	1.2288	1.3307	1.4184	1.5033	1.6407	1.7630	2.172	5.322	6.050	7.037	7.776	8.399	8.936	9.191
230	1.1570	1.2259	1.3254	1.4098	1.4896	1.6116	1.7091	1.8868	3.808	5.097	6.281	7.087	7.728	8.285	8.562
240	1.1551	1.2232	1.3205	1.4017	1.4773	1.5878	1.6703	1.7982	2.085	3.918	5.540	6.474	7.107	7.692	7.949
250	1.1533	1.2206	1.3158	1.3941	1.4654	1.5674	1.6399	1.7412	1.9131	2.445	4.780	5.794	6.523	7.133	7.396
260	1.1515	1.2177	1.3113	1.3870	1.4552	1.5492	1.6139	1.7004	1.8532	2.070	3.981	5.184	5.967	6.592	6.868
270	1.1498	1.2149	1.3063	1.3799	1.4453	1.5333	1.5913	1.6678	1.7705	1.9361	3.160	4.579	5.438	6.090	6.382
280	1.1480	1.2124	1.3021	1.3736	1.4362	1.5191	1.5723	1.6407	1.7277	1.8553	2.543	3.990	4.928	5.624	5.921
290	1.1463	1.2099	1.2979	1.3672	1.4271	1.5058	1.5553	1.6168	1.6938	1.7982	2.239	3.426	4.440	5.176	5.476
300	1.1448	1.2077	1.2937	1.3616	1.4194	1.4941	1.5408	1.5962	1.6656	1.7553	2.077	2.942	3.982	4.760	5.066
310	1.1431	1.2055	1.2895	1.3559	1.4116	1.4828	1.5272	1.5780	1.6415	1.7203	1.9743	2.582	3.552	4.355	4.675
320	1.1414	1.2034	1.2860	1.3504	1.4043	1.4723	1.5145	1.5625	1.6197	1.6903	1.9038	2.348	3.177	3.981	4.301
330	1.1399	1.2009	1.2820	1.3452	1.3970	1.4626	1.5026	1.5470	1.6008	1.6642	1.8529	2.194	2.860	3.632	3.960
340	1.1382	1.1985	1.2788	1.3399	1.3904	1.4537	1.4910	1.5333	1.5835	1.6431	1.8077	2.087	2.612	3.327	3.664

VOLUMENES ESPECIFICOS DEL D₂O LIQ., cm³/g

ρ , kg/cm ³	t , °C						
	50	100	150	200	250	300	350
1	0.9125	—	—	—	—	—	—
5	0.9123	0.9402	0.9832	—	—	—	—
10	0.9122	0.9400	0.9830	—	—	—	—
25	0.9118	0.9393	0.9821	—	—	—	—
50	0.9108	0.9382	0.9806	1.0430	1.128	—	—
75	0.9098	0.9371	0.9791	1.0408	1.124	—	—
100	0.9088	0.9360	0.9777	1.0386	1.120	1.269	—
125	0.9078	0.9349	0.9763	1.0365	1.116	1.259	—
150	0.9068	0.9338	0.9749	1.0344	1.112	1.250	—
175	0.9058	0.9327	0.9735	1.0323	1.109	1.242	—
200	0.9048	0.9316	0.9721	1.0302	1.105	1.235	1.589
225	0.9038	0.9305	0.9707	1.0281	1.102	1.228	1.534
250	0.9029	0.9294	0.9694	1.0260	1.098	1.221	1.494
275	0.9020	0.9283	0.9680	1.0239	1.095	1.214	1.464
300	0.9011	0.9272	0.9666	1.0218	1.092	1.208	1.438
325	0.9002	0.9261	0.9652	1.0197	1.089	1.202	1.418
350	0.8993	0.9250	0.9638	1.0176	1.086	1.196	1.400
375	0.8984	0.9239	0.9625	1.0155	1.083	1.191	1.384
400	0.8975	0.9229	0.9611	1.0135	1.081	1.185	1.370
425	0.8966	0.9217	0.9597	1.0114	1.078	1.180	1.376
450	0.8957	0.9206	0.9583	1.0094	1.075	1.175	1.344
475	0.8948	0.9195	0.9570	1.0074	1.072	1.171	1.332
500	0.8940	0.9185	0.9556	1.0054	1.069	1.167	1.322
				1.0034			1.312

VOLUMEN ESPECIFICO REDUCIDO DEL AGUA PESADA

t, °C	5	10	15	20	25	30	35	40
v_4^t	0.99987	0.99948	0.99958	1.00016	1.00111	1.00243	1.00415	1.00605

15.p.24

VOLUMENES ESPECIFICOS DEL D₂O (cm³/g)

Presión p, kg/cm ²	Temperatura t, °C										
	150	200	250	300	350	400	450	500	550	600	650
1	1 780	1 993	2 208	2 421	2 634	2 845	3 058	3 271	3 482	3 694	3 906
5	—	390.4	435.5	479.5	523.0	566.2	609.1	652.0	694.8	737.4	780.0
10	—	189.3	213.8	236.9	259.3	281.2	303.0	324.7	346.4	367.9	389.3
25	—	—	80.10	91.03	100.9	110.2	119.4	128.3	137.3	146.1	154.8
50	—	—	—	41.79	47.80	53.12	58.13	62.94	67.57	72.13	76.62
75	—	—	—	24.63	29.69	33.99	37.67	41.08	44.32	47.49	50.59
100	—	—	—	—	20.76	24.37	27.39	30.12	32.70	35.17	37.57
125	—	—	—	—	15.00	18.50	21.20	23.56	25.71	27.77	29.76
150	—	—	—	—	10.75	14.50	17.03	19.19	21.07	22.86	24.55
175	—	—	—	—	—	11.58	14.05	16.03	17.73	19.33	20.84
200	—	—	—	—	—	9.298	11.78	13.66	15.24	16.68	18.05
250	—	—	—	—	—	5.806	8.546	10.32	11.73	12.99	14.14
300	—	—	—	—	—	2.931	6.325	8.170	9.385	10.54	11.57
350	—	—	—	—	—	2.000	4.707	6.457	7.717	8.774	9.731
400	—	—	—	—	—	—	3.540	5.260	6.460	7.465	8.340
450	—	—	—	—	—	—	2.782	4.349	5.496	6.449	7.265
500	—	—	—	—	—	—	2.347	3.658	4.751	5.644	6.423

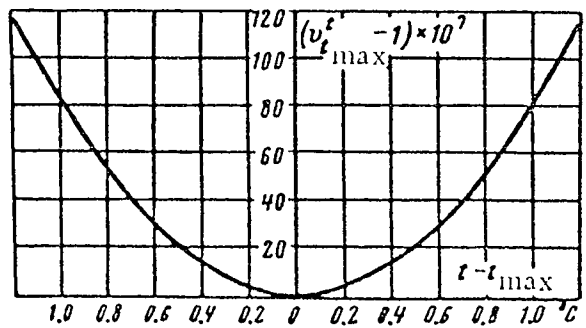
15-p.148

VOLUMENES RELATIVOS DE AGUA LIVIANA Y AGUA PESADA EN LAS CERCANIAS DE LA TEMPERATURA DE MAXIMA DENSIDAD.

$t-t_{\max}$	$t_{\text{H}_2\text{O}}$	$t_{\text{D}_2\text{O}}$	$(v_{t_{\max}}^t - 1) \cdot 10^7$	
			H ₂ O	D ₂ O
-1.2	2.78	10.03	117	117
-0.7	3.28	10.53	40	39
-0.2	3.78	11.03	3.6	3.4
-0	3.98	11.23	0	0
+0.2	4.18	11.43	3.4	2.9
+0.7	4.68	11.93	38	40
+1.2	5.18	12.43	113	116
+1.7	5.68	12.93	227	229
+2.2	6.18	13.43	377	396

Nota: El volumen relativo $v_{t_{\max}}^t$ es la relación entre el volumen específico del agua a la temperatura t y este volumen específico a su temperatura de máxima densidad.

15-p.32



Dependencia de $v_{t_{\max}}^t$ en los valores $(t-t_{\max})$ para agua liviana y pesada.

15-p.33

COMPARACION DE LOS VALORES CALCULADOS DE VOLUMENES ESPECIFICOS DEL D₂O

350° C				360° C			
$p, \text{ kg/cm}^2$	v_{exp}	v_{calc}	$\delta, \%$	$p, \text{ kg/cm}^2$	v_{exp}	v_{calc}	$\delta, \%$
89.38	24.02	24.04	+0.08	74.29	31.11	31.11	0
147.61	11.12	11.15	+0.27	135.68	13.88	13.92	+0.28
186.63	1.560	1.562	+0.13	167.66	9.392	9.410	+0.20
—	—	—	—	191.8 ^a	6.113	6.119	+0.10
—	—	—	—	251.64	1.559	1.557	-0.13
369° C				371° C			
$p, \text{ kg/cm}^2$	v_{exp}	v_{calc}	$\delta, \%$	$p, \text{ kg/cm}^2$	v_{exp}	v_{calc}	$\delta, \%$
77.87	30.14	30.15	+0.03	120.84	17.42	17.43	+0.05
125.25	16.21	16.25	+0.25	171.85	9.912	9.930	+0.18
184.76	8.303	8.326	+0.24	209.38	5.869	5.875	+0.10
212.61	4.946	4.954	+0.16	220.24	4.019	4.023	+0.10
217.69	2.012	2.010	-0.10	223.81	2.051	2.050	-0.05
233.08	1.794	1.791	-0.16	237.69	1.834	1.833	-0.06
254.03	1.683	1.681	-0.12	280.35	1.648	1.647	-0.06
296.88	1.585	1.584	-0.06	—	—	—	—
372° C				380° C			
$p, \text{ kg/cm}^2$	v_{exp}	v_{calc}	$\delta, \%$	$p, \text{ kg/cm}^2$	v_{exp}	v_{calc}	$\delta, \%$
93.94	24.24	24.25	+0.04	91.37	25.68	25.69	+0.04
152.19	12.40	12.43	+0.25	143.14	14.23	14.24	+0.08
199.95	7.047	7.062	+0.21	198.71	7.980	7.993	+0.16
221.33	4.338	4.343	+0.12	232.12	4.889	4.894	+0.10
224.14	2.819	2.822	+0.11	244.06	3.140	3.139	-0.03
227.25	2.089	2.090	+0.05	251.82	2.270	2.269	-0.04
252.15	1.774	1.772	-0.11	270.63	1.918	1.917	-0.05
282.64	1.659	1.659	-0.06	292.49	1.781	1.780	-0.06
332.97	1.561	1.560	-0.07	325.95	1.673	1.671	-0.12
—	—	—	—	354.94	1.612	1.611	-0.06
—	—	—	—	391.66	1.558	1.557	-0.06
400° C				450° C			
$p, \text{ kg/cm}^2$	v_{exp}	v_{calc}	$\delta, \%$	$p, \text{ kg/cm}^2$	v_{exp}	v_{calc}	$\delta, \%$
91.87	26.91	26.92	+0.04	91.17	30.37	30.38	+0.03
142.24	15.58	15.57	-0.06	138.21	18.81	18.83	+0.10
190.19	10.13	10.12	-0.10	172.81	14.27	14.28	+0.07
246.46	6.030	6.029	-0.02	226.64	9.884	9.888	+0.04
279.40	4.034	4.035	+0.03	274.08	7.382	7.380	-0.03
297.71	3.031	3.032	+0.03	314.01	5.826	5.823	-0.05
316.39	2.410	2.411	+0.04	345.15	4.848	4.846	-0.04
351.38	1.992	1.993	+0.05	394.29	3.651	3.649	-0.06
378.03	1.855	1.856	+0.06	452.41	2.754	2.753	-0.04
418.64	1.730	1.730	0.00	482.81	2.469	2.467	-0.08
460.14	1.649	1.650	+0.06	504.02	2.322	2.321	-0.04
509.32	1.582	1.582	0.00	—	—	—	—

continuación

500° C			
p , kg/cm ²	v_{exp}	v_{calc}	δ , %
83.12	36.80	36.80	0.0
149.74	19.23	19.22	-0.05
201.73	13.52	13.51	-0.07
250.27	10.31	10.30	-0.10
293.13	8.334	8.326	-0.10
328.61	7.090	7.083	-0.10
364.07	6.091	6.088	-0.05
395.86	5.350	5.349	-0.02
422.01	4.832	4.834	+0.04
449.34	4.363	4.364	+0.03
474.53	3.989	3.990	+0.03
500.74	3.652	3.650	-0.05

$$\delta = \frac{v_{calc} - v_{exp}}{v_{calc}} \cdot 100\%$$

15-p.154 y 155

COMPARACION DE VALORES CALCULADOS DE
VOLUMENES ESPECIFICOS DEL H₂O

p , kg/cm ²	Temperatura °C					
	100	200	300	400	500	600
1	1 730	2 215	2 690	3 163	3 635	4 107
	1 729	2 215	2 691	3 163	3 635	4 106
10		210.3	263.2	312.6	361.2	409.1
		210.3	263.3	312.7	361.0	408.9
50			46.40	59.04	70.01	80.23
			46.42	59.05	69.95	80.19
100				27.05	33.54	39.11
				27.07	33.51	39.10
150				16.12	21.32	25.40
				16.14	21.31	25.40
200				10.29	15.16	18.52
				10.31	15.15	18.54
250				6.358	11.43	14.41
				6.362	11.42	14.43
300				3.066	8.934	11.69
				3.068	8.930	11.70
350					7.145	9.749
					7.139	9.751
400					5.807	8.286
					5.802	8.291
450					4.792	7.149
					4.788	7.157
500					4.026	6.248
					4.022	6.256

15-p.156

COMPARACION DE VALORES CALCULADOS Y EXPERIMENTALES DE $\sigma = PV/RT_{cr}$ EN LA
LINEA DE SATURACION DEL H_2O

$t, ^\circ C$	σ_{exp}	σ_{calc}	$\delta, \%$	$t, ^\circ C$	σ_{exp}	σ_{calc}	$\delta, \%$
0	0.42185	0.42178	-0.02	210	0.66586	0.66504	-0.12
10	0.43716	0.43707	-0.02	220	0.66857	0.66813	-0.07
20	0.45239	0.45228	-0.03	230	0.66960	0.66934	-0.05
30	0.46733	0.46737	-0.04	240	0.66899	0.66883	-0.02
40	0.48254	0.48234	-0.04	250	0.66665	0.66674	+0.02
50	0.49741	0.49710	-0.06	260	0.66239	0.66265	+0.04
60	0.51206	0.51166	-0.08	270	0.65601	0.65634	+0.05
70	0.52645	0.52594	-0.10	280	0.64735	0.64774	+0.06
80	0.54054	0.53991	-0.10	290	0.63614	0.63653	+0.06
90	0.55429	0.55350	-0.14	300	0.62204	0.62232	+0.05
100	0.56760	0.56668	-0.16	310	0.60467	0.60474	+0.02
110	0.58042	0.57939	-0.17	320	0.58352	0.58333	-0.03
120	0.59267	0.59159	-0.18	330	0.58783	0.55725	-0.11
130	0.60428	0.60319	-0.17	340	0.52642	0.52705	-0.11
140	0.61522	0.61416	-0.17	350	0.48734	0.48544	-0.35
150	0.62538	0.62442	-0.15	360	0.43533	0.43273	-0.65
160	0.63474	0.63393	-0.10	370	0.35221	0.35003	-0.63
170	0.64316	0.64201	-0.17	371	0.33963	0.33765	-0.60
180	0.65061	0.64962	-0.17	372	0.32473	0.32290	-0.56
190	0.65694	0.65580	-0.17	373	0.30552	0.30413	-0.47
200	0.66212	0.66125	-0.13	374	0.26975	0.26893	-0.30

$$\delta = \frac{\sigma_{calc} - \sigma_{exp}}{\sigma_{calc}} = -0.07\%$$

COMPARACION DE VALORES CALCULADOS DE VOLUMENES ESPECIFICOS DEL D₂O
CON DATOS EXPERIMENTALES

250° C			300° C			350° C			360° C		
P, kg/cm ²	v		P, kg/cm ²	v		P, kg/cm ²	v		P, kg/cm ²	v	
	exp	calc		exp	calc		exp	calc		exp	calc
81.87	1.123	1.123	103.78	1.268	1.265	222.30	1.498	1.499	251.64	1.559	1.555
194.87	1.106	1.106	173.16	1.243	1.240	262.28	1.451	1.452	291.23	1.501	1.502
300.03	1.092	1.092	242.28	1.223	1.221	312.37	1.409	1.409	341.92	1.449	1.451
397.57	1.081	1.079	310.33	1.205	1.204	374.03	1.370	1.369	384.90	1.416	1.418
497.25	1.070	1.067	400.41	1.185	1.183	425.96	1.343	1.341	432.82	1.386	1.385
						496.75	1.313	1.312	496.43	1.353	1.350
369° C			371° C			372° C			380° C		
P, kg/cm ²	v		P, kg/cm ²	v		P, kg/cm ²	v		P, kg/cm ²	v	
	exp	calc		exp	calc		exp	calc		exp	calc
338.28	1.523	1.524	330.89	1.551	1.548	378.14	1.505	1.505	447.36	1.497	1.495
385.75	1.473	1.476	406.33	1.468	1.471	433.30	1.453	1.455	497.95	1.455	1.453
436.16	1.433	1.435	496.27	1.405	1.404	496.54	1.412	1.409			
498.64	1.393	1.393									

15-p.158

COMPARACION DE VALORES CALCULADOS DE VOLUMENES ESPECIFICOS DEL D₂O
CON LOS VALORES EXPERIMENTALES

P.kg/cm ²	50° C		100° C		150° C		200° C		250° C	
	γ.g/cm ³	δ. %	γ.g/cm ³	δ. %	γ.g/cm ³	δ. %	γ.g/cm ³	δ. %	γ.g/cm ³	δ. %
10	1.09610 1.09623	-0.01	1.06395 1.06370	+0.02	1.01706 1.01743	-0.04	—	—	—	—
20	1.09656 1.09671	-0.01	1.06446 1.06420	+0.02	1.01767 1.01802	-0.03	0.95830 0.95844	-0.01	—	—
30	1.09701 1.09719	-0.02	1.06496 1.06476	+0.02	1.01827 1.01861	-0.03	0.95913 0.95923	-0.01	—	—
40	1.09746 1.09767	-0.02	1.06547 1.06538	+0.01	1.01888 1.01921	-0.03	0.95994 0.96003	-0.01	—	—
50	1.09791 1.09816	-0.02	1.06597 1.06580	+0.02	1.01948 1.01980	-0.03	0.96073 0.96081	-0.01	0.88495 0.88686	-0.19
60	1.09837 1.09865	-0.03	1.06648 1.06632	+0.02	1.02003 1.02040	-0.03	0.96151 0.96161	-0.01	0.88679 0.88809	-0.15
70	1.09882 1.09912	-0.03	1.06698 1.06684	+0.01	1.02069 1.02098	-0.03	0.96231 0.96241	-0.01	0.88849 0.88932	-0.09
80	1.09927 1.09961	-0.03	1.06749 1.06738	+0.01	1.02129 1.021 8	-0.03	0.96309 0.96319	-0.01	0.89003 0.89055	-0.06
90	1.09973 1.10009	-0.03	1.06799 1.06790	+0.01	1.02189 1.02217	-0.03	0.96386 0.96399	-0.01	0.89146 0.89178	-0.04
100	1.10018 1.10058	-0.04	1.06849 1.06842	+0.01	1.02250 1.02277	-0.03	0.96465 0.96478	-0.01	0.89282 0.89302	-0.02

VOLUMENES MOLARES DEL D₂O, cm³/mol

$t, ^\circ\text{C}$ $p, \text{kg/cm}^2$	-20	-15	-10	-5	0	20	40	50	60	80	100
1	—	—	—	—	18.122	18.125	18.200	18.270	18.363	18.570	—
500	—	—	—	—	17.692	17.739	17.835	17.904	17.985	18.174	18.400
1 000	—	—	—	17.305	17.328	17.404	17.512	17.585	17.665	17.850	18.048
1 500	—	—	16.974	16.994	17.014	17.110	17.235	17.305	17.385	17.552	17.753
2 000	—	16.660	16.685	16.712	16.741	16.854	16.982	17.054	17.130	17.302	17.486
2 500	16.380	16.410	16.440	16.468	16.501	16.620	16.751	16.827	16.905	17.067	17.250
3 000	16.155	16.188	16.221	16.255	16.287	16.411	16.543	16.617	16.693	16.850	17.028
3 500	—	15.987	16.025	16.061	16.094	16.215	16.353	16.425	16.503	16.657	16.824
4 000	—	15.807	15.843	15.879	15.915	16.040	16.178	16.252	16.330	16.477	16.634
5 000	—	—	—	15.567	15.600	15.730	15.870	15.949	16.015	16.150	16.330
6 000	—	—	—	—	15.352	15.465	15.597	15.671	15.740	15.875	16.023
7 000	—	—	—	—	—	15.215	15.358	15.427	15.494	15.625	15.763
8 000	—	—	—	—	—	15.001	15.140	15.207	15.272	15.402	15.533
9 000	—	—	—	—	—	14.803	14.944	15.010	15.074	15.198	15.328
10 000	—	—	—	—	—	—	14.767	14.827	14.885	15.007	15.137
11 000	—	—	—	—	—	—	14.605	14.663	14.718	14.835	14.961
12 000	—	—	—	—	—	—	14.452	14.508	14.563	14.677	14.807

15-p.48

VOLUMEN MOLAR DEL AGUA PESADA

T(°K)	V calc (CC)	V obs (CC)	% error
276.98 (PF)	18.130	18.118	- 0.07
284.39	18.093	18.111	- 0.10
293.15	18.144	18.125	0.10
313.15	18.355	18.200	0.85
333.15	18.600	18.363	1.29
353.15	18.870	18.570	1.62
374.57	19.189	...	...
423.15	20.049	...	...

6-p.1469

1

DATOS FISICOQUIMICOS DEL SH_2
Y SUS COMPUESTOS DEUTERADOS.

PROPIEDADES FISICAS DEL SH_2

Punto de fusión	- 85.60°C
ΔH (fusión)	0.5676 Kcal/mol
Punto de ebullición	- 60.75 °C
ΔH (vaporización)	4.463 Kcal/mol
Temperatura de transición	- 169.6 °C y -145.0 °C
Temperatura crítica	100.4 °C
Presión crítica	89 atm
Calor de formación	+ 4.80 Kcal/mol
Densidad	0.993 g/cm ³ (-60 °C)
Constante dieléctrica	~10 (-60 °C), ~6 (0°C)
Momento dipolar	1.10×10^{-18} μ (fase gaseosa)

1-p.836

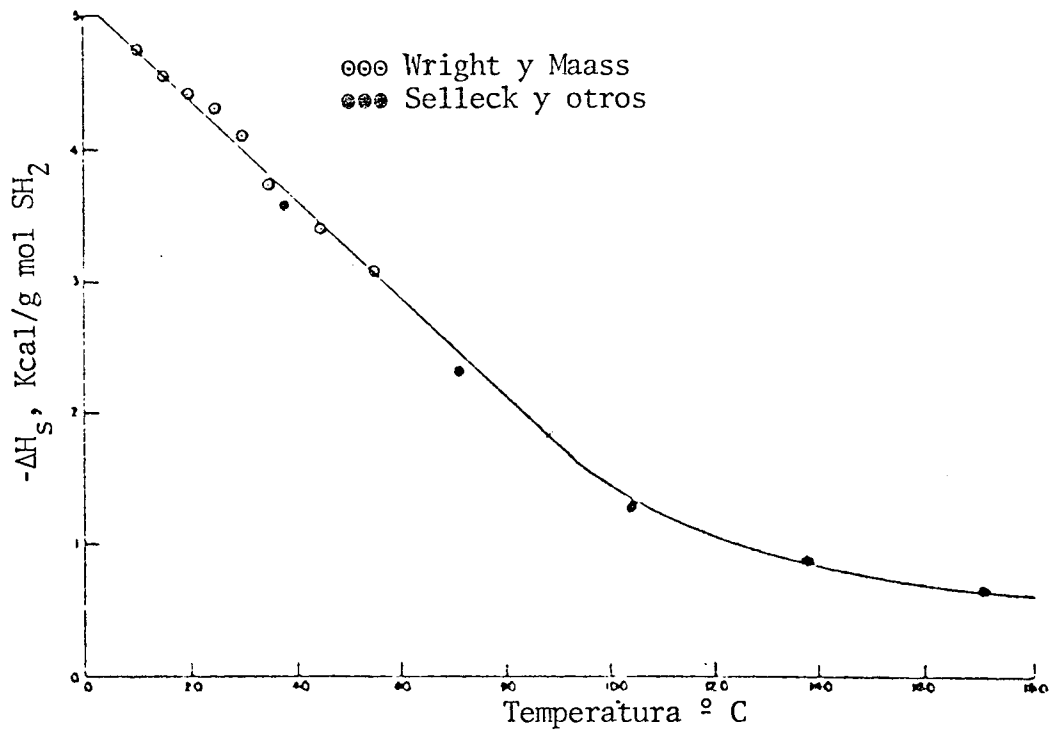
CALOR DE COMBUSTION DEL SH_2 .

136,71 cal/mol a p= cte.

10-p.125

CALOR DE DISOLUCION DEL SH_2 .1 mol SH_2 / 900 vol. H_2O 4,75 cal

10-p.125



Calor de disolución del SH_2 en H_2O .

11-p.518

CALOR DE DISOLUCION DEL SH_2 EN AGUA

t, °C	T, °K	$1/T_K^\circ \times 10^3$	$-R \ln c$	$\Delta(R \ln c)$ de T a T + 10°K	$\Delta(1/T_K)$	$\Delta H, \times 10^3$
5	278.1	3.59582	3.429	0.594	0.12481	4.759
10	283.1	3.53232	3.730	0.550	0.12052	4.563
15	288.1	3.47101	4.023	0.514	0.11626	4.421
20	293.1	3.41180	4.280	0.484	0.11256	4.2995
25	298.1	3.35457	4.537	(227, $\Delta T=5^\circ$)	(0.05533)	(4.10)
30	303.1	3.29924	4.764	0.394	0.10538	3.739
40	313.1	3.19386	5.158	0.338	0.09885	3.419
50	323.1	3.09501	5.496	0.285	0.09291	3.067
60	333.1	3.00210	5.781	-----	-----	-----

11-p.519

CALOR DE FORMACION DEL HIDRATO SOLIDO.

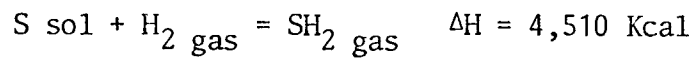
16,34 Cal/mol

10-p.125

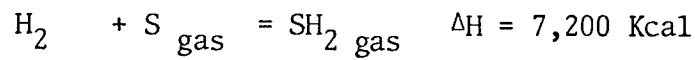
CALOR DE FUSION DEL SH₂.

568,3 Cal/mol

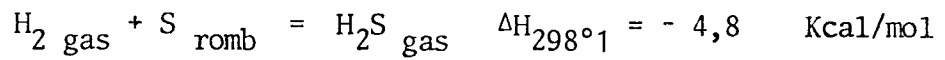
16-p.972

CALOR DE FORMACION DEL SH₂.

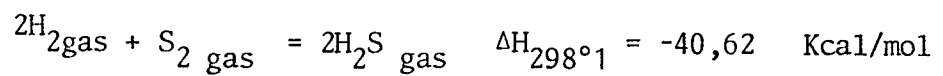
$$\Delta H = 4,820 \text{ Kcal}$$



10-p.125



$$\Delta F_{298^\circ 1}^\circ = -7,865 \text{ Kcal/mol}$$



$$\Delta F_{298^\circ 1}^\circ = -35,085 \text{ Kcal/mol}$$

16-p.865

RELACIONES DE CAPACIDAD CALORIFICA Y CAPACIDADES TERMICAS RELATIVAS DEL
SH₂ GASEOSO Y H₂O LIQUIDA SATURADOS ENTRE SI A 250 PSIA.

Temp. ^o C.	C _L /C _G	γ	a L/G = 0.52	γ a	L/G = 0.50	γ a	L/G = 0.48	γ a	L/G = 0.46	γ a	L/G = 0.44
30	2.13576	1.11050	1.05788	1.02516	0.98245	0.93973					
31	2.10272	1.09341	1.05136	1.00931	0.96725	0.92520					
32	2.07025	1.07653	1.04513	0.99372	0.95232	0.91091					
33	2.03798	1.05975	1.01899	0.97823	0.93747	0.89671					
34	2.00511	1.04318	1.00306	0.96293	0.92281	0.88269					
35	1.97442	1.02670	0.98721	0.94772	0.90823	0.86874					
36	1.94299	1.01035	0.97150	0.93264	0.89378	0.85492					
37	1.91191	0.99419	0.95596	0.91772	0.87948	0.84124					
38	1.88105	0.97815	0.94053	0.90290	0.86528	0.82766					
39	1.85038	0.96220	0.92519	0.88818	0.85117	0.81417					
40	1.81986	0.94633	0.90893	0.87353	0.83714	0.80074					
41	1.78963	0.93063	0.89484	0.85905	0.82325	0.78746					
42	1.75948	0.91493	0.87974	0.84455	0.80936	0.77417					
43	1.72987	0.89953	0.86494	0.83034	0.79574	0.76114					

11-p.519

CALOR ESPECIFICO A PRESION CONSTANTE DEL SH₂ GASEOSO

		20 °C-1/3 at	20 °C-1 at			
C_p	8,237	8,179	8,100	6,45	8,290	8,831
C_v	6,170	6,166	6,036	8,728	6,253	6,750
$\gamma=\frac{C_p}{C_v}$	1,340	1,32	1,34	1,313	1,326	1,308

10-p.124

CALOR ESPECIFICO A PRESION CONSTANTE C_p DEL SH_2 (GAS,

T°K	216	224	228	229	278
C_p cal/M °	9,98	9,72	9,52	9,56	8,92
C_{po} (*)	9,62	9,39	9,21	9,26	8,75

(*) para presiones muy pequeñas.

16-p.961

CALOR ESPECIFICO DEL SH_2 SOLIDO

T°K		11,1 ₈	12,4 ₇	13,3 ₇	14,9 ₁	15,8 ₃	17,4 ₂	17,5 ₆
C_p cal/mol.°		0,24 ₁	0,41 ₈	0,52 ₉	0,67 ₁	0,75 ₇	0,88 ₃	0,94 ₀
T	18,5 ₆	20,0	21,4	26,0	29,9	33,3	36,7	40,2
C_p	1,04 ₅	1,21 ₃	1,38 ₄	1,98 ₂	2,48 ₅	2,89 ₁	3,29 ₃	3,66 ₉
T	44,0 ₅	48,4 ₅	53,6	59,5	63,5	65,1	70,6	71,6
C_p	4,10 ₃	4,51 ₅	5,06 ₀	5,56 ₈	5,88 ₀	6,01 ₉	6,51 ₉	6,55 ₁
T	79,4	86,9	90,8 ₅	91,7	94,2	96,6	97,9	107,8
C_p	7,21 ₇	7,81 ₅	8,25 ₀	8,36 ₆	8,65 ₀	9,03 ₃	9,21 ₂	11,43 ₀
T	110,1	111,0	116,7	117,2	121,4	121,7	134,8	144,35
C_p	11,61 ₅	11,76 ₅	12,43 ₀	12,70 ₀	13,48 ₅	13,59 ₀	13,42 ₅	13,50 ₅
T	152,3	160,5	177,8	182,8				
C_p	13,605	13,61	13,92	14,18	H ₂ S liquido a 187,60 °			

16-p.968 y 969

CALOR DE SUBLIMACION DEL SH_2 (CAL/MOL) .

$$L = 6040 - 1,88 T - 0,012 T^2$$

16-p.972

CALOR ESPECIFICO A VOLUMEN CONSTANTE C_V DEL SH_2 GAS

T°, K	216°	224°	228°	229°	278°
C_V	7,75	7,51	7,33	7,37	6,81
C_p/C_V	1,29	1,29	1,30	1,30	1,31
C_{Vo}^*	7,63	7,40	7,23	7,27	6,76
C_{po}/C_{Vo}	1,26	1,27	1,28	1,28	1,30

(*) para presiones muy bajas.

16-p.962

RELACION DE CALOR ESPECIFICO A VOLUMEN
Y PRESION CONSTANTE DEL SH_2 (GAS)

t	C_p/C_V	Autores
18°	1,340	Capstick (1895)
20°	1,337	Thibaut (1910-1911)
20°	1,315	Preuner y Schupp (1910)
25°	1,321	Felsing y Drake (1936)

16-p.963

CALOR ESPECIFICO DEL SH_2 LIQUIDO

$T^\circ K$	193,6	197,0	203,3	208,9
C_p cal./mol $^\circ$	16,24	16,20	16,51	16,49

16-p.965

SOLUBILIDAD, HUMEDAD, CAPACIDAD CALORIFICA Y ENTALPIA DE SOLUCIONES ACUOSAS DE SH₂ Y H₂O GASEOSA HUMEDA
A 250 P.S.I.A.

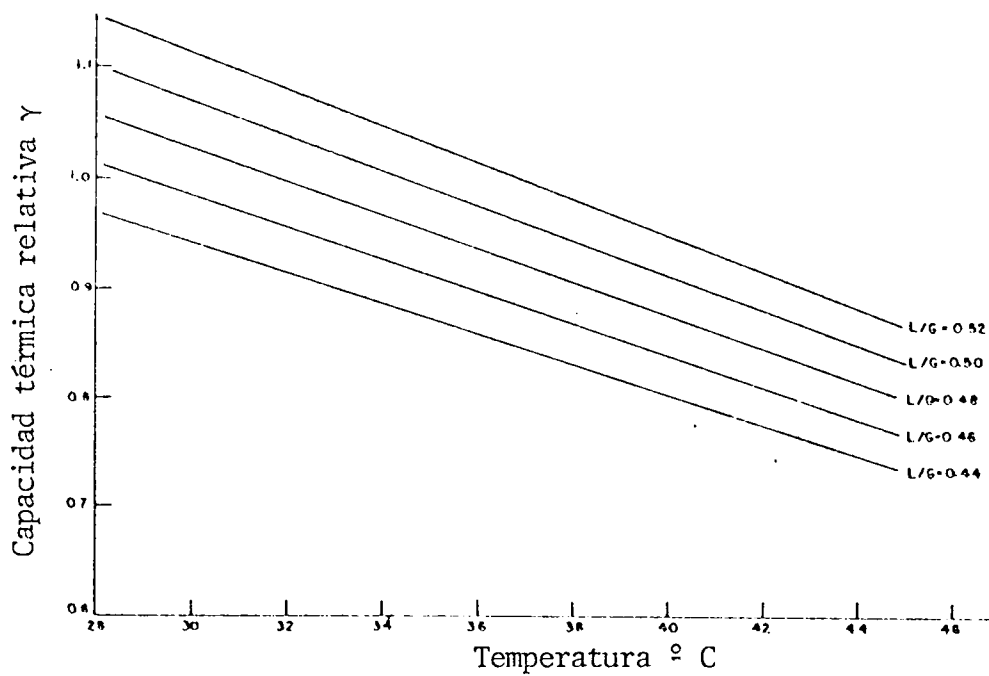
Temp., °C.	$h \times 10^3$ ^a	S^* ^b	T_i^*	$\left(\frac{\partial h}{\partial T}\right)_p \times 10^3$	C_p^*	ΔH_c	$\left(\frac{\partial H_c}{\partial T}\right)_p$	$(C_p)^*$	$\left(\frac{\partial H_c}{\partial p}\right)_p \times 10^3$	$(C_p)^*$	$\left[\frac{\partial H_c}{\partial T}\right]_p$	v_m , Ml.	$\left[\frac{\partial v_m}{\partial T}\right]_p$, Ml./°	$\left[\frac{\partial H_c}{\partial p}\right]_p$
30	3.417	0.02534	303.1	0.1818	8.1983	10.450	10.1500	21.6780	-0.5938	21.6780	3.034 × 10 ⁻⁴	1.00421	3.034 × 10 ⁻⁴	-0.4256
31	3.603	0.02475	304.1	0.1905	8.2000	10.440	10.2480	21.5487	-0.5762	21.5487	3.124 × 10 ⁻⁴		3.124 × 10 ⁻⁴	-0.4104
32	3.798	0.02419	305.1	0.1995	8.2016	10.430	10.3494	21.4259	-0.5595	21.4259	3.213 × 10 ⁻⁴		3.213 × 10 ⁻⁴	-0.3959
33	4.002	0.023633	306.1	0.2088	8.2033	10.420	10.4542	21.3055	-0.5430	21.3055	3.301 × 10 ⁻⁴		3.301 × 10 ⁻⁴	-0.3818
34	4.215	0.023100	307.1	0.2185	8.2049	10.410	10.5634	21.1914	-0.5273	21.1914	3.387 × 10 ⁻⁴		3.387 × 10 ⁻⁴	-0.3683
35	4.439	0.022580	308.1	0.2286	8.2066	10.400	10.6771	21.0811	-0.5121	21.0811	3.473 × 10 ⁻⁴	1.00610	3.473 × 10 ⁻⁴	-0.3552
36	4.673	0.022075	309.1	0.2391	8.2083	10.390	10.7953	20.9752	-0.4975	20.9752	3.557 × 10 ⁻⁴		3.557 × 10 ⁻⁴	-0.3425
37	4.917	0.021585	310.1	0.2500	8.2099	10.380	10.9179	20.8741	-0.4834	20.8741	3.640 × 10 ⁻⁴		3.640 × 10 ⁻⁴	-0.3303
(37.8)	5.121	0.02120	310.9	0.2590	8.2112	...	...	...	...	...	...		...	...
38	5.173	0.02112	311.1	0.2613	8.2116	10.370	11.0452	20.7766	-0.4698	20.7766	3.721 × 10 ⁻⁴		3.721 × 10 ⁻⁴	-0.3186
39	5.440	0.02065	312.1	0.2730	8.2132	10.360	11.1767	20.6812	-0.4564	20.6812	3.801 × 10 ⁻⁴		3.801 × 10 ⁻⁴	-0.3071
40	5.719	0.020195	313.1	0.2852	8.2149	10.350	11.3142	20.5903	-0.4436	20.5903	3.883 × 10 ⁻⁴	1.00768	3.883 × 10 ⁻⁴	-0.2960
41	6.010	0.01976	314.1	0.2978	8.2166	10.340	11.4559	20.5025	-0.4312	20.5025	3.961 × 10 ⁻⁴		3.961 × 10 ⁻⁴	-0.2854
42	6.315	0.01933	315.1	0.3110	8.2182	10.330	11.6045	20.4179	-0.4192	20.4179	4.039 × 10 ⁻⁴		4.039 × 10 ⁻⁴	-0.2750
43	6.632	0.01892	316.1	0.3245	8.2199	10.320	11.7564	20.3371	-0.4077	20.3371	4.117 × 10 ⁻⁴		4.117 × 10 ⁻⁴	-0.2651

^a Mol H₂O/mol H₂S

^b Mol H₂S/mol H₂O

^c Cal./mol °

11-p.517



Variación de la capacidad térmica relativa γ con la temperatura.

11-p.521.

COEFICIENTE DE DILATACION DEL SH_2 LIQUIDO.

174×10^{-5}

16-p.966

COEFICIENTE DE DILATACION DEL SH_2 SOLIDO.

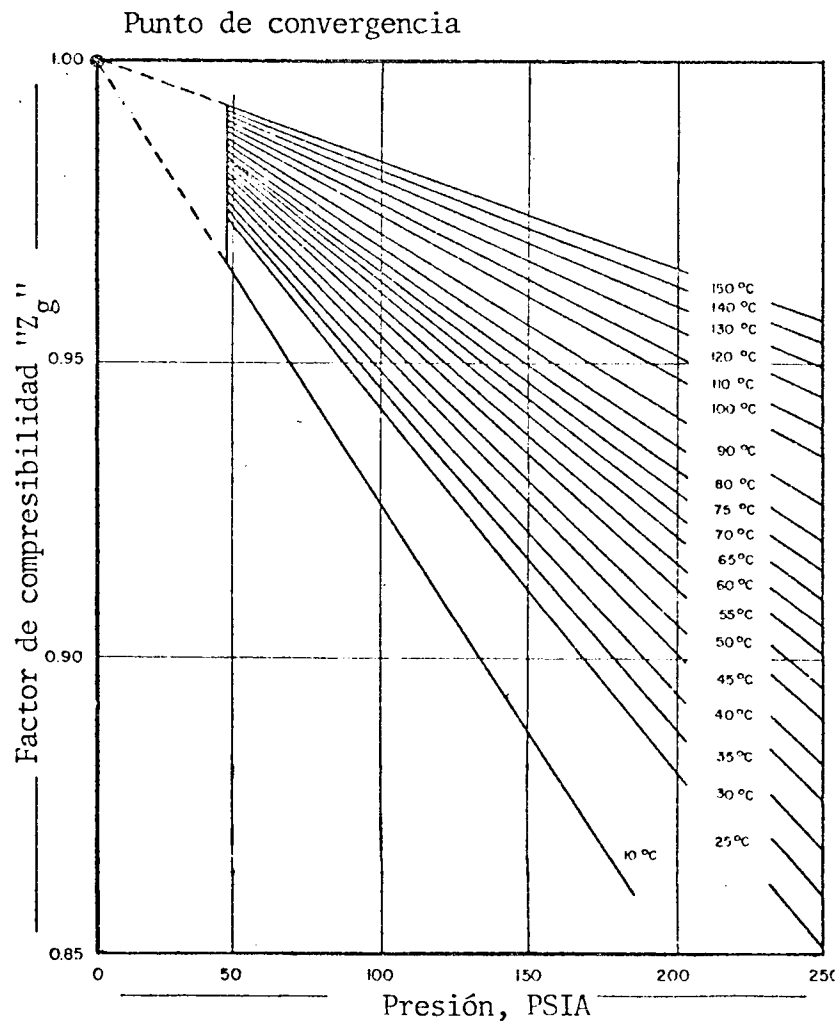
0,00053

16-p.967

COMPRESIBILIDAD DEL SH_2

p	746,872	370,877	248,987
v	166,646	337,310	502,269
p.v	124463,5	125100,6	125307,6

10-p.123

Compresibilidad del SH_2 (g).

3-p.139

CONSTANTES DE J.D. VAN DER WAALS

	referidas a 1 vol. inicial de gas	referida a mol-g	referida a gramos
a	0,00887	$4,4 \times 10^6$	3780
b	0,00191	42.5	0,870

10-p.123

CONDUCTIVIDAD TERMICA DEL SH₂ a 0°:

$$0,03045 \frac{\text{cal}}{\text{cm. seg}^\circ}$$

10-p.124

CONDUCTIVIDAD TERMICA DEL SH₂ GAS

$$335 \times 10^{-7} \frac{\text{cal}}{\text{cm. seg}^\circ}$$

16-p.964

CONSTANTE EBULLOSCOPICA DEL SH₂ LIQUIDO

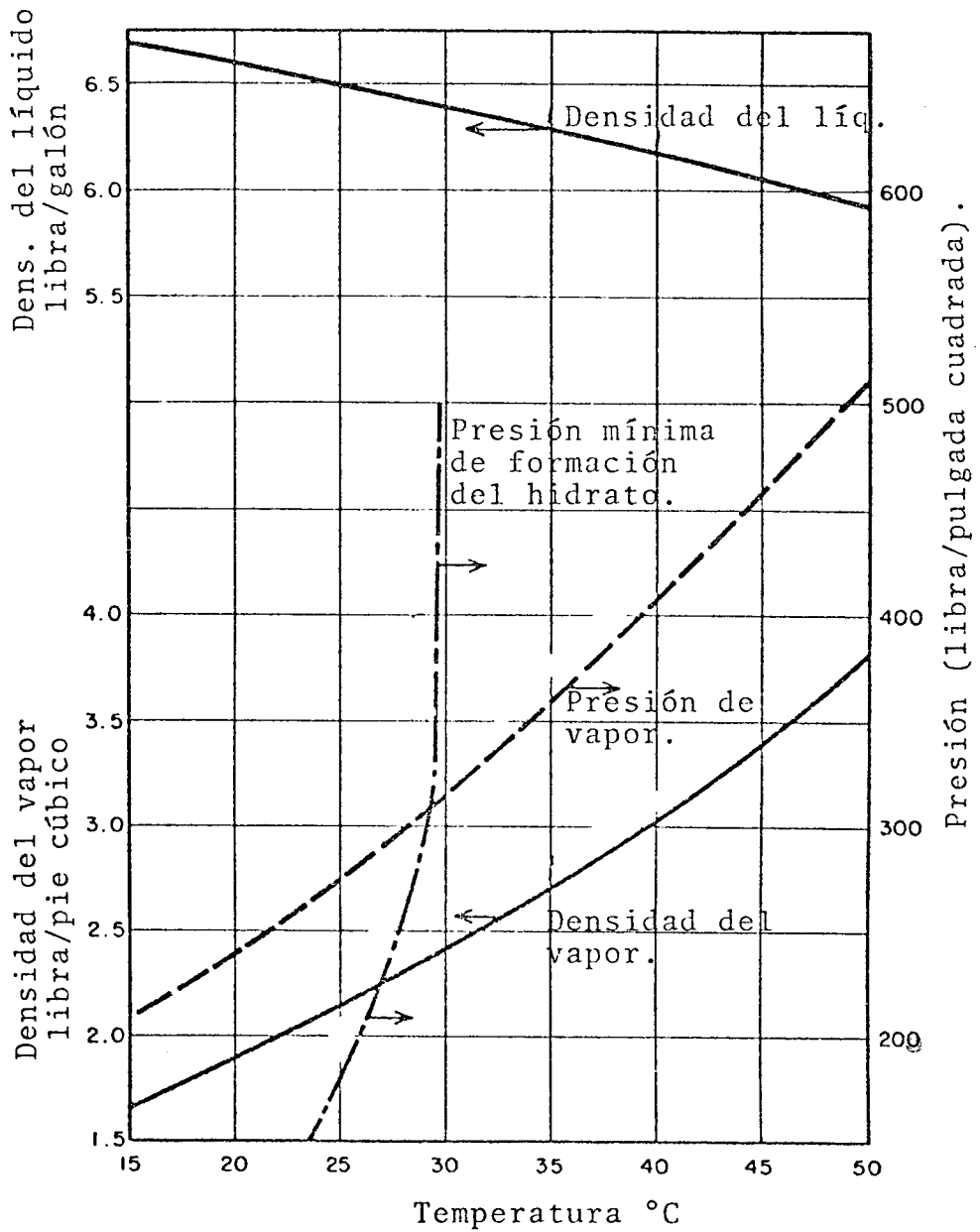
$$0,63 \text{ a } 0,72$$

10-p.125

DENSIDAD DEL SH₂ SOLIDO.

$$1,16$$

16-p.967.



Densidad y presión de vapor del SH_2 .

3-p.89

DENSIDAD DEL SH_2 LIQUIDO.

T°K	190°	192°	194°	196°	198°	200°
D	0,9888	0,9854	0,9816	0,9784	0,9748	0,9714
T°K	202°	204°	206°	208°	210°	212°
D	0,9680	0,9644	0,9609	0,9574	0,9539	0,9504

DENSIDAD DEL SH₂ Y SD₂ LIQUIDO

SH ₂			SD ₂			
Masa (g)	Temp. (°C)	Densidad (g/cm ³)	Masa (g)	Temp. (°C)	Densidad (g/cm ³)	
14.9745	-79.35	-0.98249	15.8016	-79.18	1.03684	
	-79.31	0.98246		-79.24	1.03684	
	-79.58	0.98291		-79.12	1.03677	
	-79.70	0.98311		-79.07	1.03671	
	-79.67	0.98310		-79.03	1.03657	
	-79.65	0.98306		-79.04	1.03662	
14.9522	-79.00	0.98170	15.8130	-79.06	1.03696	
	-79.00	0.98176		-79.02	1.03681	
	-78.90	0.98162		-78.94	1.03667	
	-78.77	0.98136		-78.97	1.03671	
	-78.76	0.98129		-78.98	1.03674	
	-78.77	0.98125		-78.93	1.03664	
	-78.72	0.98122		-78.89	1.03656	
15.3462	-79.21	0.98227	15.8170	-79.27	1.03714	
	-79.33	0.98247		-79.18	1.03700	
	-79.31	0.98210		-79.02	1.03678	
Ave.	-79.00	0.98180		-79.01	1.03673	
				-78.96	1.03669	
$\sigma = 0.00007$		-78.99		1.03667		
		-78.92		1.03661		
		-78.93		1.03658		
		-78.92		1.03655		
		Ave	-79.00	1.03667		
		$\sigma = 0.00008$				

DENSIDAD DEL SH₂ GAS.

1 litro de gas SH₂ a 0°C y 760 mm de Hg pesa 1,5223 g.

1 litro de gas SH₂ a 0°C y 760 mm de Hg pesa 1,5392 g.

10-p.123

DENSIDAD CRITICA DEL SH₂.

0,3103

16-p. 971

DENSIDAD DEL SH₂ GASEOSO EN RELACION AL AIRE.

1,1895 ± 0,0004

16-p.959

DENSIDAD DEL SH₂ GASEOSO EN RELACION AL OXIGENO.

Densidad	Autores
1,0762	Leduc
1,0772	Baume y Perrot
1,077	Klemenc y Bankowski
1,07662	Moles, Toral y Escribano

16-p.959.

VARIACION DE LAS FUNCIONES TERMODINAMICAS ESTANDARD POR EFECTO ISOTOPICO

Temperatura (°C)	$\Delta\Delta G^\circ$ (cal/mol)		$\Delta\Delta H^\circ$ (cal/mol)		$\Delta\Delta S^\circ$ (cal/° mol)		$\Delta\Delta C_p^\circ$ (cal/° mol)	
	Valor	σ	Valor	σ	Valor	σ	Valor	σ
-80.0	6.40	0.09	54.9	3.8	0.251	0.020	-0.67	0.19
-75.0	5.19	0.07	51.6	2.9	0.234	0.015	-0.65	0.18
-70.0	4.06	0.11	48.4	2.1	0.218	0.011	-0.62	0.16
-65.0	3.00	0.15	45.4	1.4	0.204	0.007	-0.60	0.14
-60.275	2.07	0.17	42.6	0.8	0.190	0.005	-0.58	0.12
-60.176	2.05	0.17	42.5	0.8	0.190	0.005	-0.58	0.12
-60.0	2.02	0.18	42.4	0.8	0.190	0.004	-0.57	0.12
-55.0	1.10	0.19	39.6	0.4	0.177	0.002	-0.55	0.11
-50.0	0.25	0.19	37.0	0.6	0.164	0.002	-0.52	0.09
-45.0	-0.54	0.18	34.4	0.9	0.153	0.003	-0.50	0.07
-40.0	-1.28	0.17	32.0	1.1	0.143	0.004	-0.47	0.05
-35.0	-1.97	0.15	29.6	1.4	0.133	0.005	-0.45	0.04
-30.0	-2.61	0.12	27.5	1.5	0.124	0.006	-0.42	0.03
-25.0	-3.21	0.10	25.4	1.5	0.115	0.006	-0.40	0.02
-20.0	-3.76	0.08	23.5	1.5	0.108	0.006	-0.37	0.03
-15.0	-4.28	0.07	21.7	1.4	0.100	0.005	-0.35	0.04
-10.0	-4.77	0.06	20.0	1.2	0.094	0.005	-0.32	0.06
-5.0	-5.23	0.06	18.4	1.0	0.088	0.004	-0.30	0.08
0.0	-5.65	0.06	17.0	0.9	0.083	0.003	-0.27	0.09
5.0	-6.05	0.06	15.7	1.0	0.078	0.003	-0.25	0.11
10.0	-6.43	0.06	14.5	1.3	0.074	0.005	-0.22	0.13
15.0	-6.79	0.06	13.4	1.8	0.070	0.006	-0.20	0.14
20.0	-7.14	0.08	12.5	2.5	0.067	0.009	-0.17	0.16
25.0	-7.46	0.12	11.7	3.3	0.064	0.011	-0.15	0.18
30.0	-7.78	0.17	11.0	4.2	0.062	0.014	-0.12	0.20
35.0	-8.08	0.24	10.4	5.2	0.060	0.018	-0.10	0.21
40.0	-8.38	0.34	10.0	6.3	0.059	0.021	-0.07	0.23
45.0	-8.67	0.45	9.7	7.5	0.058	0.025	-0.05	0.25
50.0	-8.96	0.58	9.5	8.8	0.057	0.029	-0.02	0.27

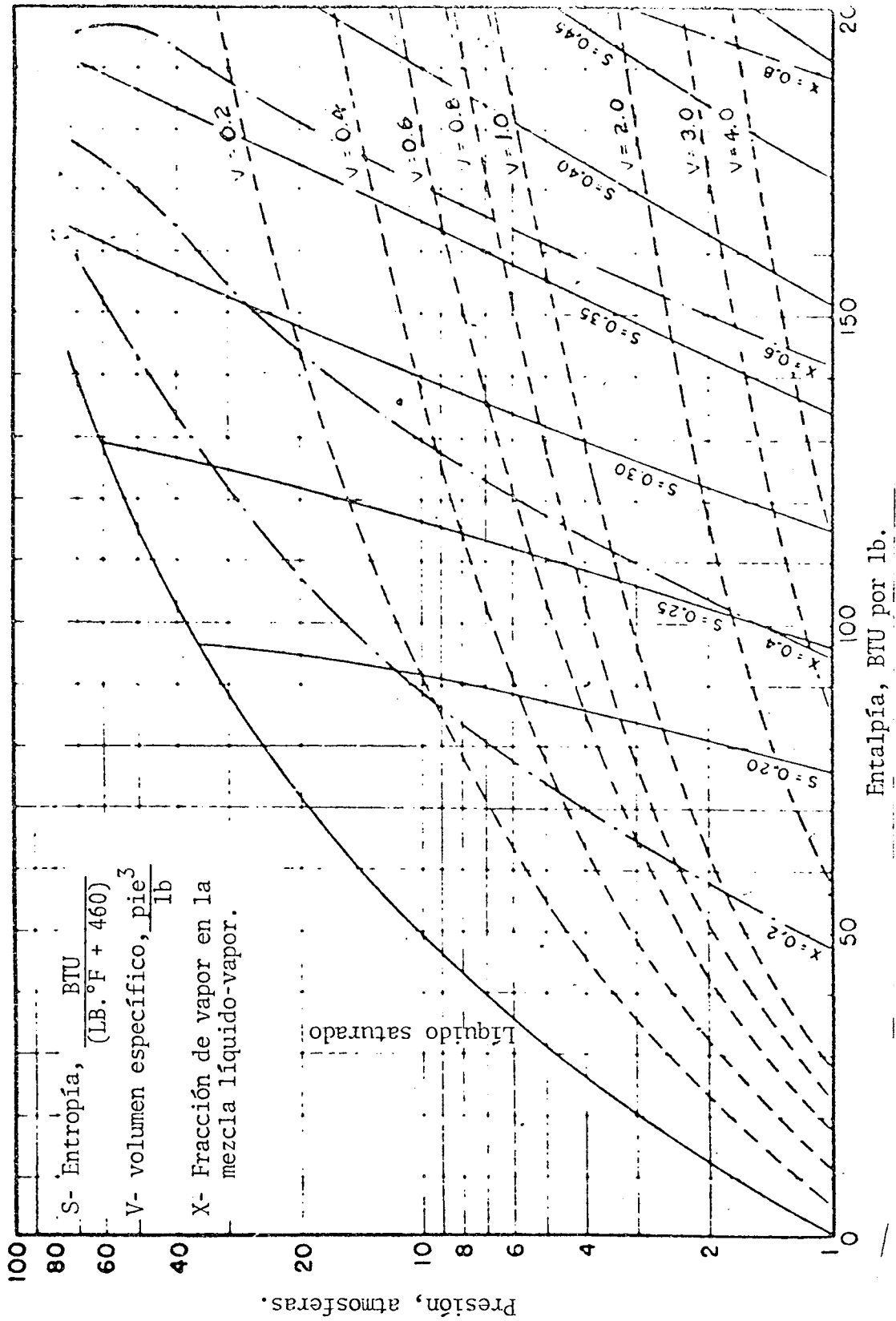
VARIACIONES DE LAS FUNCIONES TERMODINAMICAS ESTANDARD DE VAPORIZACION DEL SH_2

Temperatura (°C)	ΔG° (cal/mol)		ΔH° (cal/mol)		ΔS° (cal/° mol)		ΔC_p° (cal/° mol)	
	Valor	σ	Valor	σ	Valor	σ	Valor	σ
-80.0	431.11	0.12	4642.3	9.1	21.803	0.047	- 8.04	0.50
-75.0	322.61	0.10	4601.9	6.8	21.596	0.035	- 8.12	0.45
-70.0	215.14	0.24	4561.1	4.7	21.393	0.024	- 8.21	0.40
-65.0	108.68	0.34	4519.8	2.8	21.192	0.015	- 8.29	0.35
-60.275	8.98	0.39	4480.5	1.4	21.005	0.008	- 8.37	0.31
-60.176	6.91	0.39	4479.6	1.4	21.001	0.008	- 8.38	0.31
-60.0	3.21	0.39	4478.2	1.3	20.994	0.008	- 8.38	0.31
-55.0	101.27	0.41	4436.0	0.8	20.799	0.004	- 8.46	0.26
-50.0	204.78	0.41	4393.5	1.6	20.606	0.006	- 8.55	0.21
-45.0	307.34	0.38	4350.6	2.5	20.416	0.010	- 8.63	0.16
-40.0	408.95	0.33	4307.2	3.2	20.228	0.012	- 8.72	0.12
-35.0	509.62	0.28	4263.4	3.6	20.042	0.014	- 8.80	0.08
-30.0	609.37	0.22	4219.1	3.8	19.858	0.015	- 8.89	0.05
-25.0	708.20	0.18	4174.5	3.8	19.676	0.015	- 8.98	0.06
-20.0	806.14	0.15	4129.4	3.6	19.496	0.014	- 9.06	0.10
-15.0	903.17	0.15	4083.9	3.2	19.318	0.013	- 9.15	0.14
-10.0	999.32	0.17	4037.9	2.7	19.142	0.011	- 9.23	0.19
- 5.0	1094.59	0.19	3991.5	2.3	18.968	0.009	- 9.32	0.23
0.0	1189.00	0.21	3944.8	2.3	18.795	0.008	- 9.40	0.28
5.0	1282.54	0.21	3897.5	3.0	18.623	0.011	- 9.49	0.33
10.0	1375.24	0.22	3849.9	4.4	18.454	0.016	- 9.57	0.37
15.0	1467.08	0.24	3801.8	6.2	18.285	0.022	- 9.66	0.42
20.0	1558.09	0.30	3753.3	8.3	18.118	0.029	- 9.74	0.47
25.0	1648.27	0.42	3704.4	10.7	17.953	0.037	- 9.83	0.52
30.0	1737.62	0.60	3655.1	13.3	17.789	0.046	- 9.91	0.57
35.0	1826.16	0.83	3605.3	16.2	17.626	0.055	-10.00	0.61
40.0	1913.88	1.12	3555.1	19.4	17.464	0.065	-10.08	0.66
45.0	2000.81	1.46	3504.5	22.8	17.304	0.076	-10.17	0.71
50.0	2086.93	1.86	3453.4	26.4	17.145	0.087	-10.25	0.76

VARIACIONES DE LAS FUNCIONES TERMODINAMICAS ESTANDARD DE VAPORIZACION DEL SD_2

- Temperatura (°C)	ΔG° (cal/mol)		ΔH° (cal/mol)		ΔS° (cal/° mol)		ΔC_p° (cal/° mol)	
	Valor	σ	Valor	σ	Valor	σ	Valor	σ
-80.0	437.51	0.15	4697.3	9.9	22.054	0.051	-8.71	0.53
-75.0	327.80	0.12	4653.6	7.4	21.831	0.038	-8.77	0.48
-70.0	219.19	0.27	4609.5	5.1	21.611	0.027	-8.83	0.43
-65.0	111.68	0.37	4565.2	3.2	21.396	0.017	-8.89	0.38
-60.275	11.05	0.43	4523.1	1.6	21.196	0.009	-8.95	0.33
-60.176	8.96	0.43	4522.2	1.6	21.191	0.009	-8.95	0.33
-60.0	5.23	0.43	4520.6	1.6	21.184	0.009	-8.95	0.33
-55.0	100.17	0.45	4475.7	0.9	20.976	0.004	-9.01	0.28
-50.0	204.53	0.45	4430.5	1.7	20.771	0.006	-9.07	0.23
-45.0	307.88	0.42	4384.9	2.6	20.569	0.010	-9.13	0.18
-40.0	410.23	0.37	4339.1	3.4	20.370	0.013	-9.19	0.13
-35.0	511.59	0.31	4293.0	3.8	20.175	0.015	-9.25	0.09
-30.0	611.98	0.25	4246.6	4.1	19.982	0.016	-9.31	0.06
-25.0	711.41	0.20	4199.9	4.1	19.792	0.016	-9.37	0.07
-20.0	809.90	0.17	4152.8	3.9	19.604	0.015	-9.43	0.10
-15.0	907.46	0.17	4105.5	3.5	19.419	0.014	-9.49	0.15
-10.0	1004.09	0.18	4057.9	3.0	19.236	0.012	-9.56	0.20
-5.0	1099.82	0.20	4010.0	2.5	19.056	0.010	-9.62	0.24
0.0	1194.65	0.22	3961.7	2.5	18.877	0.009	-9.68	0.29
5.0	1288.60	0.22	3913.2	3.2	18.701	0.011	-9.74	0.35
10.0	1381.67	0.23	3864.4	4.6	18.527	0.016	-9.80	0.40
15.0	1473.88	0.25	3815.2	6.5	18.355	0.023	-9.86	0.45
20.0	1565.23	0.31	3765.8	8.7	18.185	0.030	-9.92	0.50
25.0	1655.73	0.44	3716.1	11.2	18.017	0.039	-9.98	0.55
30.0	1745.40	0.62	3666.1	14.0	17.851	0.048	-10.04	0.60
35.0	1834.24	0.87	3615.7	17.1	17.686	0.058	-10.10	0.65
40.0	1922.27	1.17	3565.1	20.4	17.523	0.069	-10.16	0.70
45.0	2009.48	1.53	3514.2	24.0	17.362	0.080	-10.22	0.75
50.0	2095.89	1.95	3462.9	27.8	17.202	0.092	-10.28	0.80

Propiedades termodinámicas del SH_2 .



Propiedades termodinámicas del SH_2 .

ENTALPIA DE VAPORIZACION DEL SH₂.

4230 cal/mol

4585 cal/mol

10-p.125

CALOR DE VAPORIZACION DEL SH₂ EN EL PUNTO DE FUSION.

4680 ± 4 cal/mol

16-p.972

VARIACION DE LA ENTALPIA DEL SH₂ GASEOSO SECO, CON LA PRESION

Temp.		Presión		Entalpía	
				B.t.u.	Cal. por
°F.	°C.	P.S.I.	Atm.	por lb.	Mol
80	26.67	14.7	1.0	273.7	5182.5
80	26.67	147	10.0	265.5	5027.2
80	26.67	294	20.0	...	...
100	37.78	14.7	1.0	277.7	5258.2
100	37.78	147	10.0	270.3	5118.1
100	37.78	294	20.0	262.2	4964.7
120	48.89	14.7	1.0	282.5	5349.1
120	48.89	147	10.0	275.5	5216.6
120	48.89	294	20.0	267.7	5068.9

11-p.517

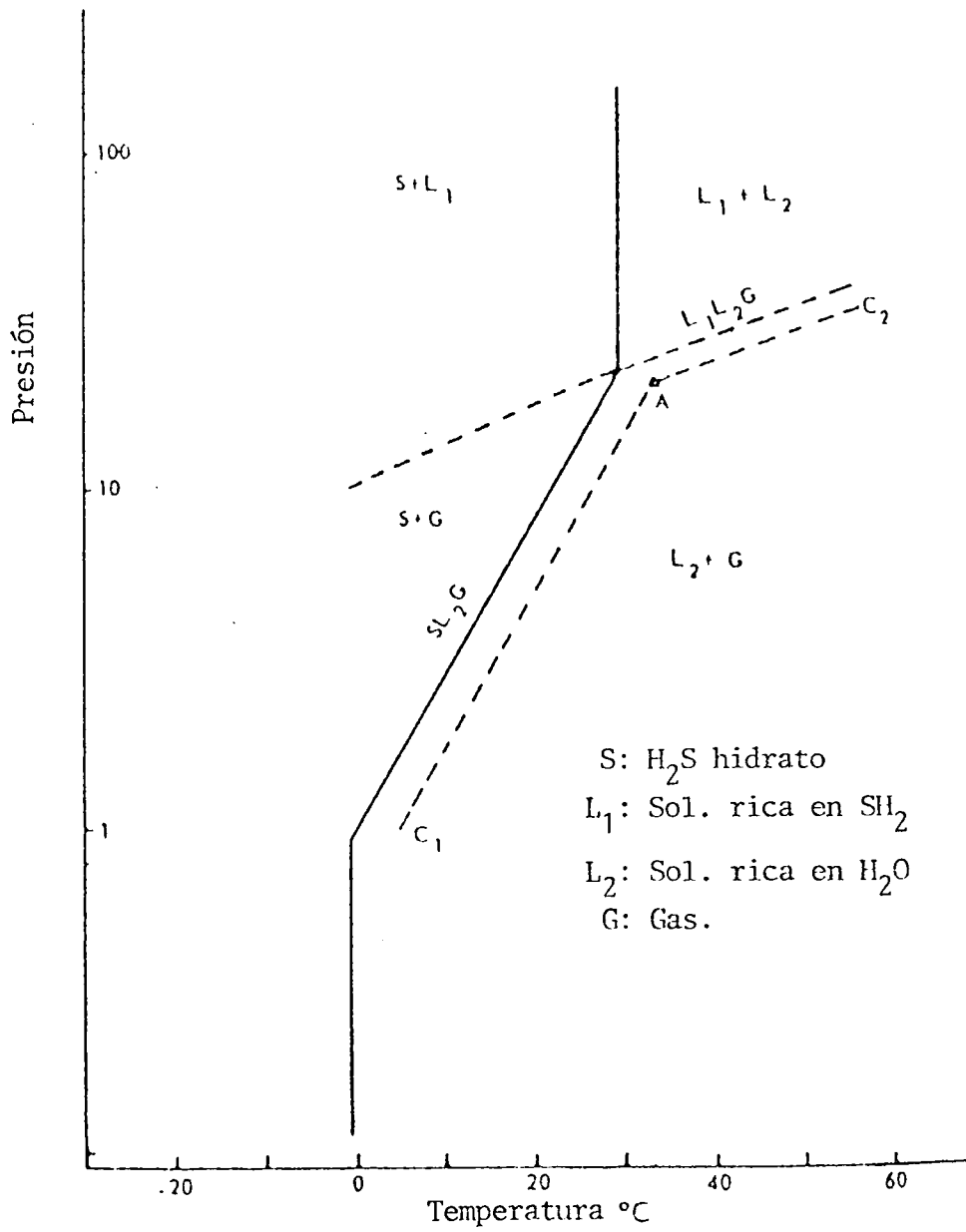
PROPIEDADES DEL SH_2 SATURADO

Temp. (°C)	Presión (atm)	V_g (cm ³ /mol)	V_l (cm ³ /mol)	ΔH_{sat} (cal/mol)
-80.0	0.32746	47990	34.65	4640
-75.0	0.44504	36140	34.96	4596
-70.0	0.59463	27650	35.27	4552
-65.0	0.78214	21470	35.60	4507
-60.275	1.0000	17110	35.91	4464
-60.176	1.0050	17030	35.91	4463
-60.0	1.0140	16900	35.93	4461
-55.0	1.2972	13450	36.26	4413
-50.0	1.6391	10830	36.61	4363
-45.0	2.0476	8811	36.97	4310
-40.0	2.5310	7234	37.34	4256
-35.0	3.0979	5990	37.73	4199
-30.0	3.7572	4999	38.13	4140
-25.0	4.5182	4205	38.54	4081
-20.0	5.3903	3561	38.97	4020
-15.0	6.3834	3034	39.42	3957
-10.0	7.5072	2600	39.88	3891
- 5.0	8.7720	2239	40.36	3823
0.0	10.188	1938	40.86	3753
5.0	11.766	1685	41.38	3681
10.0	13.515	1471	41.93	3605
15.0	15.448	1289	42.50	3528
20.0	17.574	1134	43.11	3448
25.0	19.905	1000	43.76	3366
30.0	22.452	885.3	44.45	3282
35.0	25.225	785.9	45.20	3196
40.0	28.237	699.7	46.01	3109
45.0	31.500	624.9	46.91	3021
50.0	35.024	559.9	47.90	2932

7-p.770

PROPIEDADES DEL SD_2 SATURADO

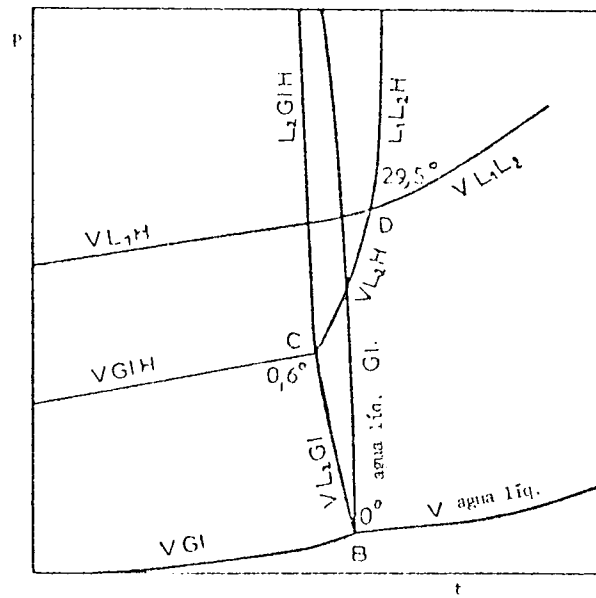
Temp. (°C)	Presión (atm)	V (cm ³ /mol)	V_l (cm ³ /mol)	ΔH_{sat} (cal/mol)
-80.0	0.32201	48810	34.75	4694
-75.0	0.43916	36630	35.07	4648
-70.0	0.58860	27940	35.38	4600
-65.0	0.77637	21630	35.71	4552
-60.275	0.99498	17200	36.02	4506
-60.176	1.0000	17120	36.03	4505
-60.0	1.0090	16980	36.04	4503
-55.0	1.2937	13470	36.38	4452
-50.0	1.6380	10840	36.73	4399
-45.0	2.0500	8801	37.09	4344
-40.0	2.5380	7213	37.47	4287
-35.0	3.1110	5964	37.86	4227
-30.0	3.7780	4970	38.26	4166
-25.0	4.5486	4175	38.68	4105
-20.0	5.4324	3532	39.11	4041
-15.0	6.4394	3006	39.56	3976
-10.0	7.5798	2573	40.03	3908
- 5.0	8.8639	2214	40.52	3838
0.0	10.302	1915	41.02	3765
5.0	11.906	1663	41.55	3690
10.0	13.685	1450	42.11	3613
15.0	15.651	1270	42.69	3533
20.0	17.815	1116	43.31	3451
25.0	20.188	983.4	43.96	3367
30.0	22.782	869.6	44.67	3281
35.0	25.609	771.2	45.43	3192
40.0	28.681	686.0	46.27	3103
45.0	32.009	612.1	47.18	3013
50.0	35.606	547.9	48.19	2922



Equilibrio de fases del sistema SH_2-H_2O .

4-p.502

DIAGRAMA P, t PARA EL SISTEMA $\text{SH}_2\text{-H}_2\text{O}$.



Ref: L_1 = líquido rico en SH_2 ; L_2 = líquido rico en H_2O ; H = hidrato del SH_2 ; GL = hielo; V = vapor.

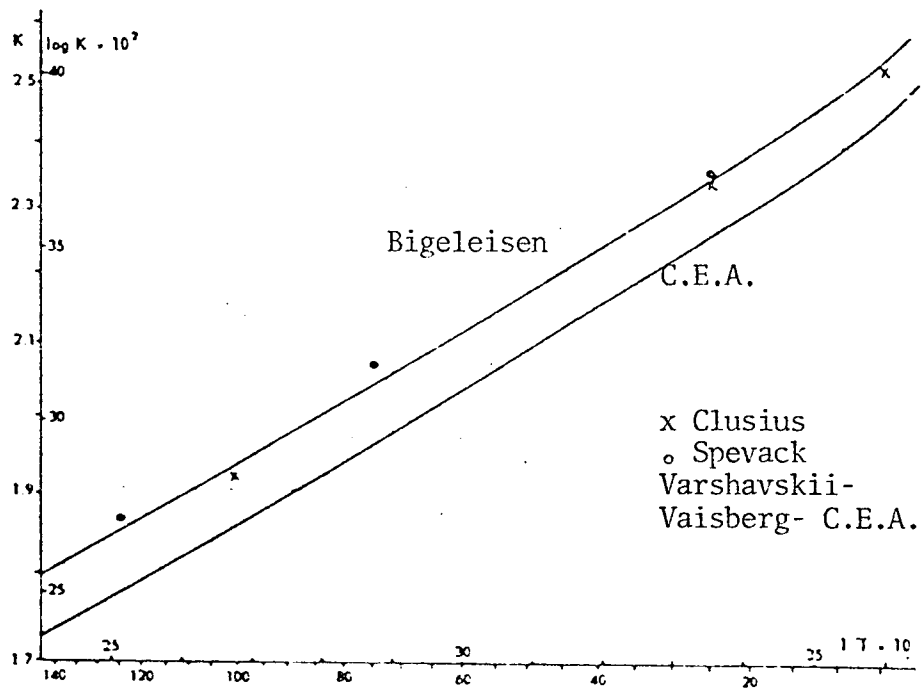
$V L_1 L_2$		$V L_1 H$		$V L_2 H$	
$^{\circ}\text{C}$	p (atm.)	$^{\circ}\text{C}$	p (atm.)	$^{\circ}\text{C}$	p (atm.)
19,4	17,3	17,4	16,6	16,3	5,9
19,8	17,4	18,4	17,0	17,9	6,3
20,6	17,8	18,7	17,05	19,7	7,6
20,8	17,9	19,0	17,2	21,0	8,6
21,2	18,0	19,9	17,6	23,3	10,7
21,4	18,2	20,9	18,0	24,8	12,9
22,8	18,85	21,2	18,1	25,6	14,0
23,0	18,95	21,8	18,4	27,4	17,1
23,65	19,3	22,9	18,9	28,5	19,5
24,6	19,7	23,65	19,3	29,2	21,3
24,8	19,8	23,8	19,35		
25,4	20,0	24,1	19,5		
25,4	20,0	26,0	20,5		
25,6	20,1	26,6	20,7		
25,8	20,2	27,2	21,0		
26,4	20,6	27,3	21,05		
26,9	20,75	28,2	21,5		
27,5	21,0	28,8	21,8		
28,0	21,3	29,4	22,1		
28,2	21,4				
28,4	21,5				
29,1	21,75				
29,2	21,9				
30,3	22,45				
31,0	22,9				
31,2	22,9				
32,0	23,4				
32,7	23,8				
33,2	24,0				

$L_1 L_2 H$	
$^{\circ}\text{C}$	p (atm.)
29,8	32

COEFICIENTE DE SEPARACION PARA LA REACCION
 $\text{H}_2\text{S}-\text{H}_2\text{O}$ A VARIAS TEMPERATURAS

$t, ^\circ\text{C}$	α	$t, ^\circ\text{C}$	α
0	2.52	80	1.94
10	2.39	90	1.90
20	2.30	100	1.86
30	2.22	110	1.82
40	2.15	120	1.79
50	2.09	130	1.76
60	2.04	140	1.73
70	1.99	150	1.71

5-p.31



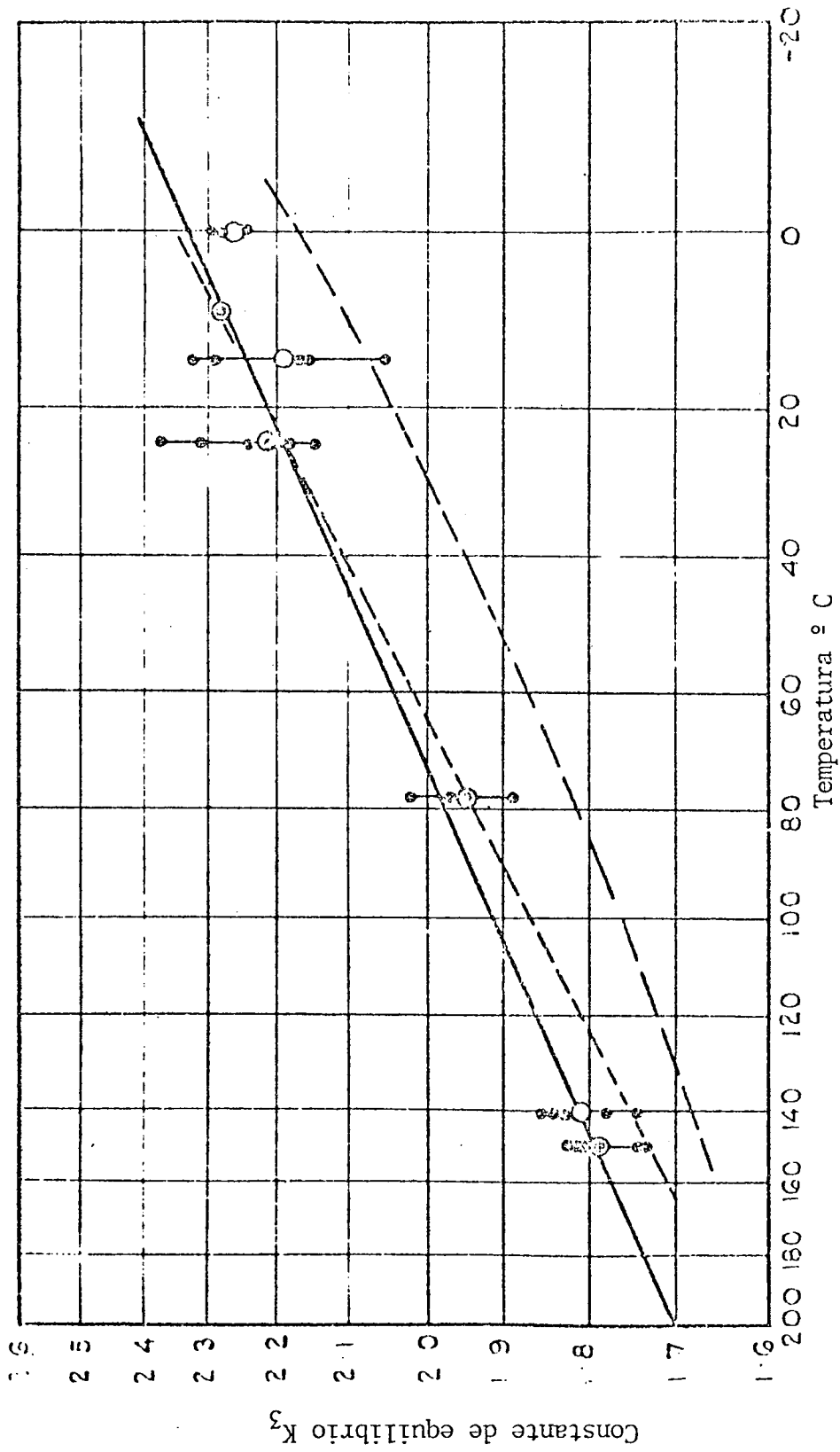
Factor de separación para la reacción:
 $\text{HDS (gas)} + \text{H}_2\text{O (liq.)} = \text{SH}_2 \text{ (gas)} + \text{HDO (liq.)}$

4-p.501

VALORES TÍPICOS DE LA CONSTANTE DE EQUILIBRIO K_3 Y DEL
 FACTOR DE ENRIQUECIMIENTO β .

T	K_3	S	H	α	β		
					$X_D = 0$	$X_D = 0.5$	$X_D = 1.0$
30°C	2.17	0.0302	0.0031	1.066	2.27	2.26	2.23
100°C	1.91	0.0119	0.066	1.026	1.85	1.86	1.88
130°C	1.83	0.0098	0.170	1.016	1.65	1.69	1.72

19-p.10



Ref: --- Teoría de Geib; — Teoría de Kimball y otros; — Datos experimentales; mejor
línea $\log K_3 = 87,93/T + 0.0458$

Comparacion de valores calculados y experimentales de la constante de equilibrio de la reacción H_2O-SHD

19- fig. 10

VARIACIONES DE LAS FUNCIONES TERMODINAMICAS ESTANDARD DEL SiH_2

Temperatura (°C)	ΔG° (cal/mol)		ΔH° (cal/mol)		ΔS° (cal/° mol)		ΔC_p° (cal/° mol)	
	Valor	σ	Valor	σ	Valor	σ	Valor	σ
0.0	-3024.91	0.34	5091.2	18.9	29.713	0.068	-38.12	1.97
5.0	-3171.75	0.21	4902.2	10.6	29.027	0.038	-37.48	1.58
10.0	-3315.23	0.22	4716.4	5.2	28.365	0.018	-36.85	1.19
15.0	-3455.44	0.21	4533.7	4.6	27.726	0.016	-36.21	0.81
20.0	-3592.52	0.17	4354.2	6.2	27.108	0.021	-35.58	0.46
25.0	-3726.56	0.17	4177.9	6.8	26.512	0.023	-34.95	0.32
30.0	-3857.67	0.21	4004.8	6.0	25.936	0.020	-34.31	0.56
35.0	-3985.95	0.26	3834.8	4.9	25.380	0.016	-33.68	0.92
40.0	-4111.50	0.28	3668.0	7.1	24.843	0.023	-33.04	1.31
45.0	-4234.41	0.29	3504.4	13.3	24.324	0.042	-32.41	1.70
50.0	-4354.77	0.43	3343.9	22.3	23.824	0.070	-31.77	2.09

8-p.698

VARIACIONES DE LAS FUNCIONES TERMODINAMICAS ESTANDARD DEL SiD_2

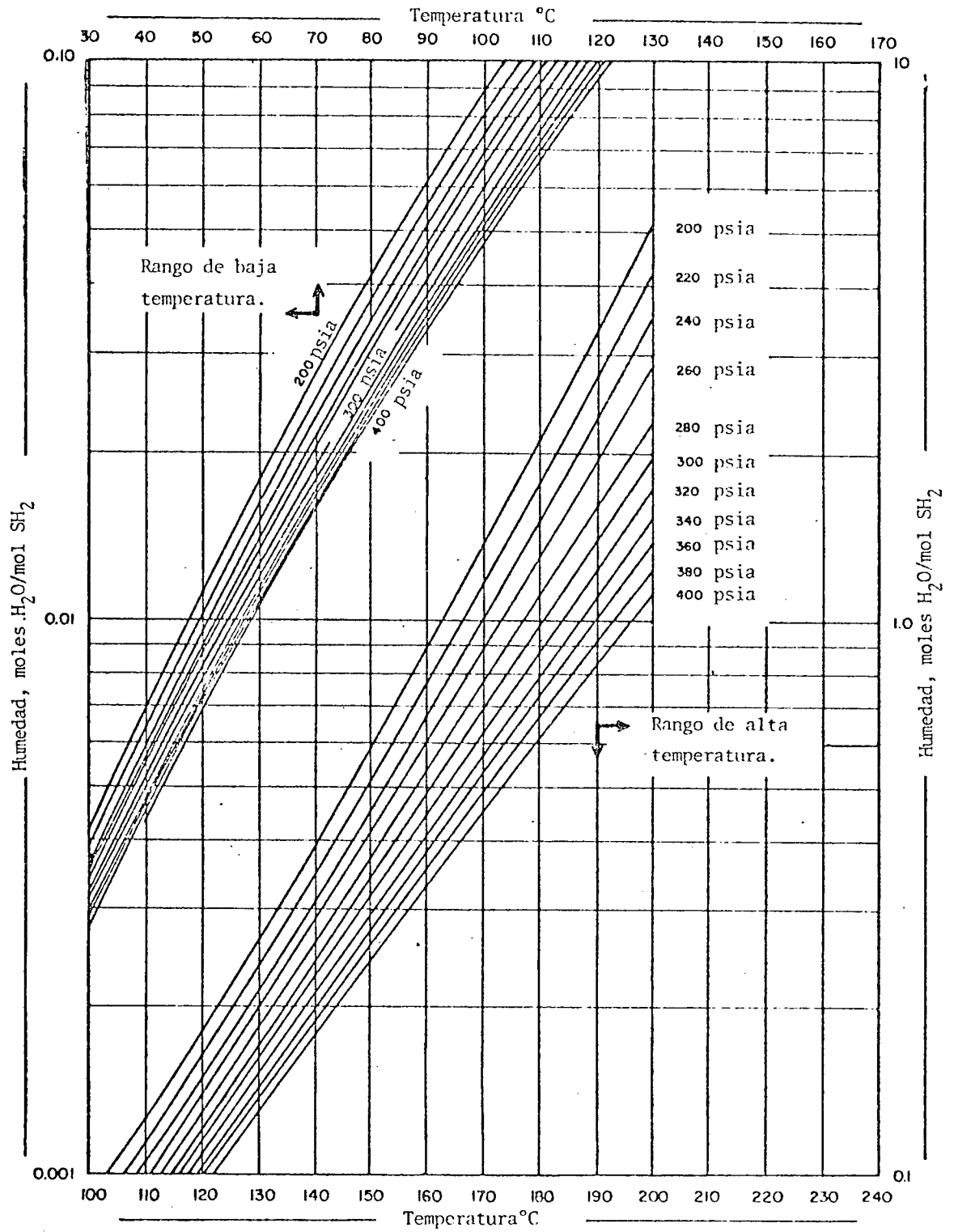
Temperatura (°C)	ΔG° (cal/mol)		ΔH° (cal/mol)		ΔS° (cal/° mol)		ΔC_p° (cal/° mol)	
	Valor	σ	Valor	σ	Valor	σ	Valor	σ
0.0	-3025.83	1.04	5328.3	49.3	30.584	0.177	-45.53	4.45
5.0	-3176.70	0.43	5103.0	29.7	29.767	0.106	-44.56	3.62
10.0	-3323.56	0.28	4882.6	14.9	28.982	0.053	-43.59	2.79
15.0	-3466.57	0.31	4667.1	7.2	28.227	0.025	-42.63	1.98
20.0	-3605.88	0.28	4456.4	9.2	27.502	0.031	-41.66	1.21
25.0	-3741.64	0.26	4250.5	11.6	26.806	0.039	-40.69	0.65
30.0	-3873.98	0.33	4049.5	11.2	26.137	0.037	-39.72	0.89
35.0	-4003.05	0.43	3853.3	9.1	25.495	0.030	-38.75	1.61
40.0	-4128.98	0.47	3662.0	11.9	24.879	0.038	-37.78	2.41
45.0	-4251.89	0.50	3475.6	23.3	24.289	0.074	-36.81	3.23
50.0	-4371.91	0.74	3293.9	40.4	23.722	0.127	-35.84	4.05

8-p.698

MAGNITUDES TERMODINAMICAS ESTANDARD DEL SH₂ GAS

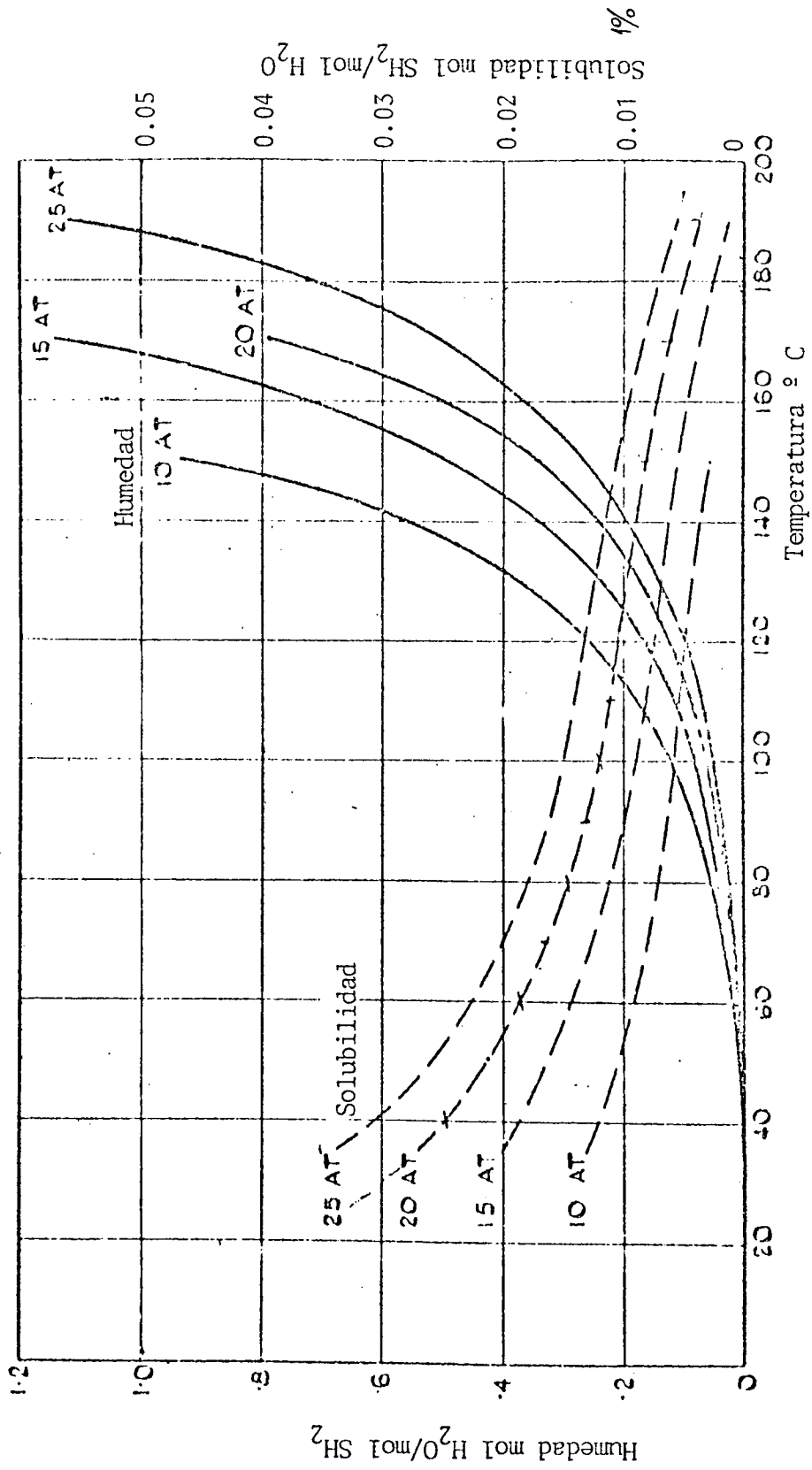
T°K	212,77°	298,1°	400°	500°	600°	700°
- (F° - E8)/T	38,489	41,174	43,53	45,34	46,83	48,13
S	46,441	49,151	51,58	53,50	55,14	56,60
T°K	800°	900°	1000°	1100°	1200°	1300°
- (F° - E8)/T	49,27	50,30	51,24	52,11	52,92	53,67
S	57,92	59,13	60,25	61,30	62,29	63,22
T°K	1400°	1500°	1600°	1700°	1800°	
- (F° - E8)/T	54,39	55,06	55,70	56,39	56,90	
S	64,09	64,92	65,71	66,46	67,17	

16-p.963



Humedad del H_2O (v) en SH_2 (g).

3-p.138



Solubilidad y humedad para el sistema SH_2-H_2O .

19- fig. 22

HUMEDAD DEL SH_2

Temp.		Presión P.S.I.A.	Humedad, h, Mol H_2O /Mol H_2S
$^{\circ}\text{C.}$	$^{\circ}\text{K.}$		
37.8	310.9	100	0.01071
		200	0.00602
		244	0.00520 (interpolado)
		250	0.00512
		300	0.00462
71.1	344.2	100	0.05340
		200	0.02817
		250	0.02343
		244	0.0238 (interpolado)
		300	0.02030

11.p-517

VIBRACIONES FUNDAMENTALES DEL SH_2 (GAS) SHD (GAS) Y SD_2 (GAS) (cm^{-1})

	ω_1	ω_1	ω_1
SH_2	2614,56	1182,68	2627,48
SHD	1901	1032	2620
SD_2	1892	855	1908

20-p. 335

INDICE DE REFRACCION PARA EL SH_2

λ ($\text{\AA}^{\circ}$)	$(n-1) \cdot 10^7$	λ ($\text{\AA}^{\circ}$)	$(n-1) \cdot 10^7$
5792,26	6408,3	4801,25	6519,8
5771,20	6409,9	4679,46	6539,2
5462,25	6437,9	4359,56	6599,4
5087,23	6479,8	4047,70	6674,6

16-p.977

INDICE DE REFRACCION DEL SH₂.

a) Indice de refracción del SH₂ gas.

1,000641	para luz blanca
1,000639	" " de Na
1,000619	
1,0006509	para luz $\lambda = 846,1 \mu\mu$
1,0006440	" " $\lambda = 546,1 \mu\mu$
1,0006412	" " $\lambda = 579 \mu\mu$
1,0006362	" " $\lambda = 656,3 \mu\mu$
1,000636	

b) Indice de refracción del líquido.

1,374	para luz de sodio
1,380	" " " " a 12,5 °C
1,390	" " del sol a 18,5 °C

10-p.125

INDICE DE REFRACCION DEL SH₂ (GAS) Y SD₂ (GAS)

$\lambda \text{ A}^\circ$	$(n-1) \cdot 10^6 \text{ (para H}_2\text{S)}$	$(n-1) \cdot 10^6 \text{ (para D}_2\text{S)}$
3802,72	675,216	671,874
3342,44	695,516	691,998
2926,25	726,963	722,962
2894,45	730,310	726,226
2760,54	746,415	742,036
2753,60	747,314	742,962
2675,78	759,033	754,328
2577,07	777,456	771,949
2464,81	806,25	799,06
2447,65	811,98	804,16
2380,74	837,3	828,0
2346,17	879	847

16-p.977

PESO MOLECULAR DEL SH₂ (GAS)

<u>PM</u>	<u>Autores</u>
32,063	Moles, Toral, Escribano
32,065 ± 0,001	Klemenc y Bankowski
32,070	Baume y Perrot

16-p.960

PRESION Y TEMPERATURA CRITICA DEL SH₂

t_c °C	P_c atm
100,2	92,0
100 ± 0,5	88,7 ± 1
100 ± 0,5	90 ± 1
99,6	88,3
100,40 ± 0,10	89,05 ± 0,10
100,43	
100,40 ± 0,10	88,90 ± 0,10
100,4	88,9
100,1 ± 0,3	

16-p.971

PRESION Y TEMPERATURA CRITICA DEL SH₂

P_c atm	t_c
----	100.4 °C
----	100.43°C
92	100.2 °C
88,7	100 °C
90	100 °C
88,3	99,6 °C
89,05	100,4 °C

10-p.125

PRESION DE VAPOR DEL SH_2

Temperatura (°C)	Presión			Error calculado sobre la presión %
	Observado (atm)	Calculado (atm)	Diferencia (%)	
29.982	22.443	22.442	+0.006	0.014
29.963	22.436	22.432	+0.020	0.014
24.997	19.903	19.903	-0.001	0.010
24.990	19.891	19.900	-0.047	0.010
20.037	17.582	17.591	-0.048	0.008
14.975	15.440	15.438	+0.015	0.008
14.954	15.439	15.429	+0.061	0.008
14.935	15.430	15.422	+0.053	0.008
9.989	13.508	13.511	-0.020	0.008
9.988	13.511	13.511	+0.003	0.008
4.992	11.760	11.763	-0.025	0.008
4.955	11.747	11.751	-0.029	0.008
0.018	10.192	10.193	-0.009	0.008
- 0.004	10.186	10.187	-0.004	0.008
- 5.016	8.769	8.768	+0.012	0.008
- 9.901	7.532	7.531	+0.015	0.008
-14.868	6.412	6.411	+0.010	0.009
-19.996	5.390	5.391	-0.016	0.011
-24.974	4.523	4.522	+0.013	0.014
-28.515	3.972	3.972	-0.010	0.016
-77.080	0.3926	0.3926	+0.007	0.011
-77.260	0.3883	0.3883	+0.003	0.011
-77.422	0.3845	0.3844	+0.007	0.011
-77.568	0.3810	0.3810	+0.006	0.011
-77.741	0.3770	0.3770	-0.007	0.011
-77.873	0.3739	0.3739	-0.015	0.011

7-p.767

PRESION DE VAPOR DEL SD_2

Temperatura (° C)	Presión			Error calculado sobre la presión %
	Observado (atm)	Calculado (atm)	Diferencia (%)	
30.023	22.789	22.795	-0.026	0.027
25.020	20.196	20.198	-0.010	0.018
20.024	17.827	17.826	+0.005	0.013
14.948	15.637	15.629	+0.052	0.011
14.899	15.613	15.609	+0.028	0.011
14.470	15.440	15.433	+0.043	0.011
9.996	13.688	13.683	+0.033	0.010
9.508	13.492	13.501	-0.070	0.011
5.014	11.905	11.910	-0.045	0.011
4.973	11.901	11.896	+0.038	0.011
4.943	11.884	11.886	-0.018	0.011
- 0.009	10.295	10.300	-0.047	0.011
- 0.013	10.303	10.298	+0.043	0.011
- 0.022	10.292	10.295	-0.031	0.011
- 5.034	8.850	8.855	-0.055	0.011
- 9.997	7.581	7.581	+0.010	0.011
-15.166	6.406	6.404	+0.036	0.013
-19.826	5.467	5.465	+0.023	0.015
-24.953	4.557	4.556	+0.017	0.019
-28.194	4.043	4.044	-0.030	0.022
-77.063	0.3872	0.3872	+0.001	0.016
-77.258	0.3827	0.3826	+0.016	0.016
-77.457	0.3779	0.3779	-0.011	0.016
-77.660	0.3732	0.3732	+0.017	0.017
-77.863	0.3684	0.3685	-0.023	0.017

RELACION DE PRESIONES DE VAPOR ENTRE SH_2 Y SD_2

Temp. (°C)	Relación de presión de vapor: P_D/P_H			Error calc. sobre la re- lación. (%)
	Experimental	Calculado	Diferencia (%)	
30.023	1.0144	1.0147	-0.024	0.028
25.020	1.0141	1.0142	-0.005	0.019
20.024	1.0142	1.0137	+0.055	0.014
14.948	1.0135	1.0131	+0.037	0.011
14.899	1.0128	1.0131	-0.033	0.011
14.470	1.0130	1.0131	-0.010	0.011
9.996	1.0131	1.0125	+0.053	0.011
9.508	1.0117	1.0125	-0.074	0.011
5.014	1.0117	1.0119	-0.021	0.011
4.973	1.0126	1.0119	+0.064	0.011
4.943	1.0120	1.0119	+0.009	0.011
- 0.009	1.0108	1.0112	-0.040	0.012
- 0.013	1.0117	1.0112	+0.044	0.012
- 0.022	1.0110	1.0112	-0.026	0.012
- 5.034	1.0098	1.0105	-0.069	0.012
- 9.997	1.0096	1.0097	-0.007	0.012
-15.166	1.0090	1.0088	+0.024	0.013
-19.826	1.0082	1.0078	+0.038	0.016
-24.953	1.0068	1.0067	+0.005	0.021
-28.194	1.0058	1.0060	-0.019	0.024
-77.063	0.9853	0.9854	-0.007	0.017
-77.258	0.9854	0.9853	+0.012	0.017
-77.457	0.9850	0.9852	-0.019	0.017
-77.660	0.9852	0.9850	+0.023	0.018
-77.863	0.9848	0.9849	-0.009	0.018

PRESION DE VAPOR DEL SH_2
 $\log P_K = - 965.423/T + 4.53336$

t, °C	P _i , atm.	P _K , atm.	d, atm.
-60.19	1.00	1.000	.0
60	1.01	1.009	-0.003
55	1.30	1.282	.015
50	1.64	1.611	.030
45	2.05	2.004	.042
40	2.52	2.469	.055
35	3.09	3.017	.073
30	3.74	3.655	.090
25	4.50	4.394	.105
20	5.36	5.245	.115
15	6.33	6.217	.110
10	7.42	7.322	.095
-5	8.64	8.571	.070
0	10.01	9.976	-0.030
+5	11.54	11.548	+0.010
10	13.23	13.298	.065
15	15.11	15.238	.130
20	17.19	17.381	.190
25	19.47	19.738	.265
30	21.98	22.321	.340
35	24.72	25.142	.420
40	27.71	28.211	.500
45	30.96	31.541	.580
50	34.48	35.142	.660
55	38.30	39.025	.730
60	42.41	43.201	.790
65	46.84	47.681	.840
70	51.60	52.474	.870
75	56.71	57.590	.880
80	62.17	63.039	.870
85	68.02	68.830	.810
90	74.27	74.971	.700
95	80.98	81.470	.490
100	88.28	88.335	.060
100.4	88.90	88.901	.001

PRESION DE VAPOR DEL SH_2

Temperatura	-110°	-99,7°	-90,6°	-87,7°	-80,9°	-72°	-64,7°	-60,1°	-58,1°
Presión de vapor en mm.	18	43	91	112	188	383	573	732	822

Temperatura	0°	10°	20°	40°	60°	80°	100°	104°
Presión de vapor en atm.	10,20	13,34	17,24	27,80	42,22	61,38	88,32	88,92

10-p.124

PRESION DE VAPOR DEL SH_2 SOLIDO

T°K	164,904	168,470	173,308	177,888	182,844
Pcm. Hg int.	2,405	3,417	5,356	8,003	12,041
T	187,61	188,350	190,506	193,840	196,980
P	17,389	18,289	21,078	26,084	31,644
T	199,909	203,400	206,575	210,176	213,166
P	37,670	46,056	54,893	66,500	77,545

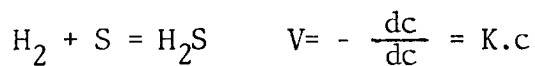
16-p.970

PRESION, FUGACIDAD Y COMPOSICION DE FASES PARA EL SH_2 SOLUBILIZADO EN AGUA

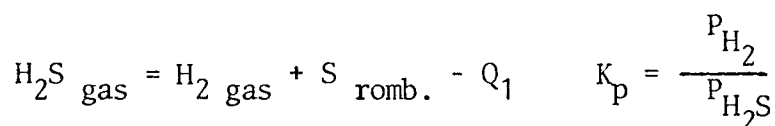
t (°C)	P (atm)	f_2 (atm)	f_1 (atm)	y_2	$x_2 \times 10^3$	$x_3 \times 10^6$	$H_{\text{H}_2\text{S}}$ (atm)
0.001	0.53985	0.53084	0.00601	0.98864	2.0189	1.14	263.18
0.001	0.64663	0.63635	0.00601	0.99048	2.4198	1.25	263.16
0.000	0.81496	0.80220	0.00601	0.99240	3.0497	1.40	263.01
4.956	0.49205	0.48108	0.00857	0.98228	1.5515	1.11	310.51
4.958	0.57457	0.56275	0.00857	0.98478	1.8146	1.20	310.21
4.955	0.69533	0.68202	0.00856	0.98738	2.1988	1.32	310.43
4.955	0.89032	0.87404	0.00856	0.99008	2.8171	1.50	310.11
10.019	0.46154	0.44737	0.01211	0.97334	1.2365	1.09	362.21
10.018	0.54041	0.52551	0.01211	0.97717	1.4522	1.18	362.01
10.019	0.65667	0.64048	0.01211	0.98115	1.7697	1.31	362.25
10.019	0.84654	0.82772	0.01210	0.98529	2.2864	1.49	361.94
15.008	0.57265	0.55280	0.01680	0.97010	1.3234	1.24	418.17
15.008	0.70044	0.67914	0.01680	0.97546	1.6255	1.37	418.11
15.006	0.91275	0.88843	0.01679	0.98105	2.1258	1.57	417.65
20.010	0.49456	0.46925	0.02304	0.95265	0.9847	1.16	477.44
20.011	0.58325	0.55711	0.02304	0.95975	1.1689	1.27	476.72
20.011	0.71673	0.68910	0.02304	0.96712	1.4456	1.41	477.10
20.009	0.94115	0.91036	0.02303	0.97479	1.9091	1.62	476.32
25.018	0.55244	0.51844	0.03122	0.94250	0.9616	1.25	540.07
25.016	0.66766	0.63249	0.03122	0.95227	1.1729	1.38	539.74
25.015	0.85319	0.81570	0.03121	0.96245	1.5122	1.56	538.73
25.018	0.58192	0.54764	0.03122	0.94536	1.0162	1.28	539.64
25.017	0.71834	0.68258	0.03122	0.95557	1.2663	1.43	539.79
25.017	0.95039	0.91146	0.03121	0.96620	1.6904	1.65	538.32
25.030	0.55377	0.51974	0.03124	0.94259	0.9645	1.25	539.12
25.029	0.68442	0.64903	0.03124	0.95338	1.2042	1.39	539.07
25.031	0.90833	0.87002	0.03123	0.96465	1.6137	1.61	539.49
29.995	0.56822	0.52353	0.04175	0.92521	0.8680	1.27	603.29
29.992	0.70403	0.65794	0.04175	0.93942	1.0907	1.43	604.07
29.995	0.93731	0.88816	0.04174	0.95421	1.4719	1.66	603.09
39.991	0.49072	0.41580	0.07250	0.84998	0.5616	1.17	741.34
39.991	0.61249	0.53649	0.07250	0.87943	0.7245	1.33	740.86
39.992	0.82651	0.74812	0.07249	0.91016	1.0100	1.57	740.57
49.987	0.54699	0.42269	0.12099	0.77499	0.4801	1.22	880.80
49.984	0.68605	0.56039	0.12099	0.82000	0.6364	1.40	882.07
49.985	0.93305	0.80438	0.12097	0.86687	0.9132	1.68	880.08

PRESION, FUGACIDAD Y COMPOSICION DE LAS FASES PARA EL SD_2 SOLUBILIZADO EN D_2O

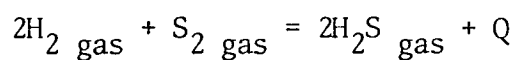
t (°C)	P (atm)	f_2 (atm)	f_1 (atm)	y_2	$x_2 \times 10^3$	$x_3 \times 10^6$	$H_{\text{D}_2\text{S}}$ (atm)
4.954	0.46205	0.45286	0.00709	0.98441	1.4489	0.56	313.07
4.953	0.53869	0.52876	0.00709	0.98659	1.6916	0.61	312.58
4.954	0.65058	0.63937	0.00709	0.98886	2.0451	0.67	312.84
4.953	0.83037	0.81661	0.00708	0.99122	2.6113	0.76	312.70
4.969	0.48660	0.47716	0.00711	0.98514	1.5266	0.58	312.86
4.969	0.56686	0.55661	0.00711	0.98721	1.7806	0.63	312.61
4.971	0.68365	0.67200	0.00711	0.98935	2.1493	0.69	312.96
4.970	0.87050	0.85607	0.00710	0.99159	2.7373	0.78	312.76
10.012	0.49623	0.48372	0.01016	0.97917	1.3152	0.59	368.17
10.011	0.58177	0.56841	0.01016	0.98219	1.5453	0.64	367.82
10.011	0.70846	0.69360	0.01016	0.98531	1.8853	0.71	368.35
10.011	0.91626	0.89831	0.01016	0.98857	2.4409	0.81	367.92
10.016	0.49103	0.47857	0.01016	0.97895	1.3017	0.59	368.13
10.017	0.57614	0.56285	0.01016	0.98201	1.5308	0.64	367.86
10.017	0.70225	0.68747	0.01016	0.98519	1.8694	0.71	368.07
10.015	0.90982	0.89199	0.01016	0.98849	2.4248	0.80	367.60
14.996	0.49292	0.47636	0.01430	0.97051	1.1202	0.60	425.51
14.995	0.58044	0.56305	0.01430	0.97489	1.3239	0.65	425.58
14.994	0.71133	0.69245	0.01430	0.97943	1.6278	0.72	425.82
14.992	0.92970	0.90768	0.01429	0.98416	2.1331	0.83	425.35
14.998	0.50118	0.48455	0.01430	0.97098	1.1375	0.60	426.70
14.999	0.58946	0.57197	0.01430	0.97526	1.3425	0.66	426.27
14.998	0.72127	0.70226	0.01430	0.97970	1.6480	0.73	426.45
14.997	0.94014	0.91795	0.01429	0.98433	2.1535	0.83	425.75
20.015	0.47451	0.45258	0.01987	0.95748	0.9288	0.59	488.06
20.017	0.56008	0.53739	0.01987	0.96388	1.1027	0.65	487.12
20.018	0.68930	0.66523	0.01987	0.97054	1.3647	0.72	487.94
20.017	0.90742	0.88041	0.01986	0.97748	1.8056	0.83	487.52
25.002	0.53870	0.50893	0.02718	0.94869	0.9207	0.64	552.92
25.001	0.65900	0.62804	0.02717	0.95792	1.1360	0.71	553.61
25.000	0.85875	0.82531	0.02717	0.96752	1.4924	0.82	552.78
25.003	0.55844	0.52849	0.02718	0.95048	0.9577	0.65	551.90
25.003	0.68292	0.65169	0.02717	0.95936	1.1807	0.73	552.79
25.003	0.88929	0.85541	0.02717	0.96861	1.5494	0.83	551.86
25.004	0.46306	0.43391	0.02719	0.94042	0.7867	0.59	552.79
25.005	0.54848	0.51861	0.02719	0.94958	0.9401	0.65	551.67
25.006	0.67873	0.64754	0.02718	0.95911	1.1736	0.72	552.34
25.005	0.90170	0.86763	0.02718	0.96902	1.5721	0.84	551.19
29.991	0.55882	0.51929	0.03676	0.93309	0.8361	0.66	621.27
29.991	0.69356	0.65267	0.03675	0.94589	1.0506	0.74	622.10
29.991	0.92605	0.88218	0.03674	0.95922	1.4196	0.86	621.08
29.998	0.62235	0.58221	0.03675	0.93982	0.9373	0.70	621.17
29.997	0.77226	0.73045	0.03675	0.95130	1.1757	0.78	622.14
29.996	1.03080	0.98533	0.03674	0.96326	1.5853	0.91	621.18
39.984	0.43164	0.36483	0.06494	0.84752	0.4797	0.57	761.39
39.982	0.51421	0.44676	0.06493	0.87173	0.5874	0.63	759.73
39.983	0.64240	0.57379	0.06493	0.89699	0.7543	0.71	761.57
39.983	0.86778	0.79658	0.06492	0.92331	1.0469	0.84	761.47
49.991	0.54232	0.42928	0.10994	0.79389	0.4746	0.64	905.21
49.991	0.68071	0.56635	0.10993	0.83525	0.6260	0.73	904.75
49.990	0.92773	0.81043	0.10992	0.87840	0.8956	0.87	905.12

REACCIONES DE FORMACION DEL SH_2 .

$t^\circ\text{C}$	234°	283°	310°	356°
K	0,0000018	0,0000329	0,000122	0,00280



a 20°	$K_p = 3,8 \times 10^{-6}$	
50°	$K_p = 8,3$	--
80°	$K_p = 15,6$	--



t°	$K \times 10^4$	Q cal
750°	0,98	38.500
830°	3,8	40.900
945°	24,5	39.900
1065°	118	41.300
1132°	260	----

16-p.862, 863 y 864

PUNTO TRIPLE DEL SH_2

$T^\circ\text{K}$	p mm de Hg	
$187,60_5 \pm 0,011$	$173,7 \pm 0,05$	Kruis y Clusius
$187,60 \pm 0,009$	$173,70 \pm 0,05$	Clusius y Frank
187,61	173,89	Giauque y Blue

16-p.972

CONSTANTE DE EQUILIBRIO PARA LA REACCION $S \text{ (GAS)} + H_2 = SH_2$

T abs.	$\log_{10} K_p$	Autores
1023	2,025	Preuner y Schupp
1103	1,710	Preuner y Schupp
1218	1,305	Preuner y Schupp
1338	0,964	Preuner y Schupp
1362	0,902	Randall, Russell, Bichowsky
1405	0,793	Preuner y Schupp
1473	0,643	Randall, Russell, Bichowsky
1537	0,490	Randall, Russell, Bichowsky
1667	0,257	Randall, Russell, Bichowsky

16-p.947

SOLUBILIDAD DEL SH_2 (GAS) EN H_2O .

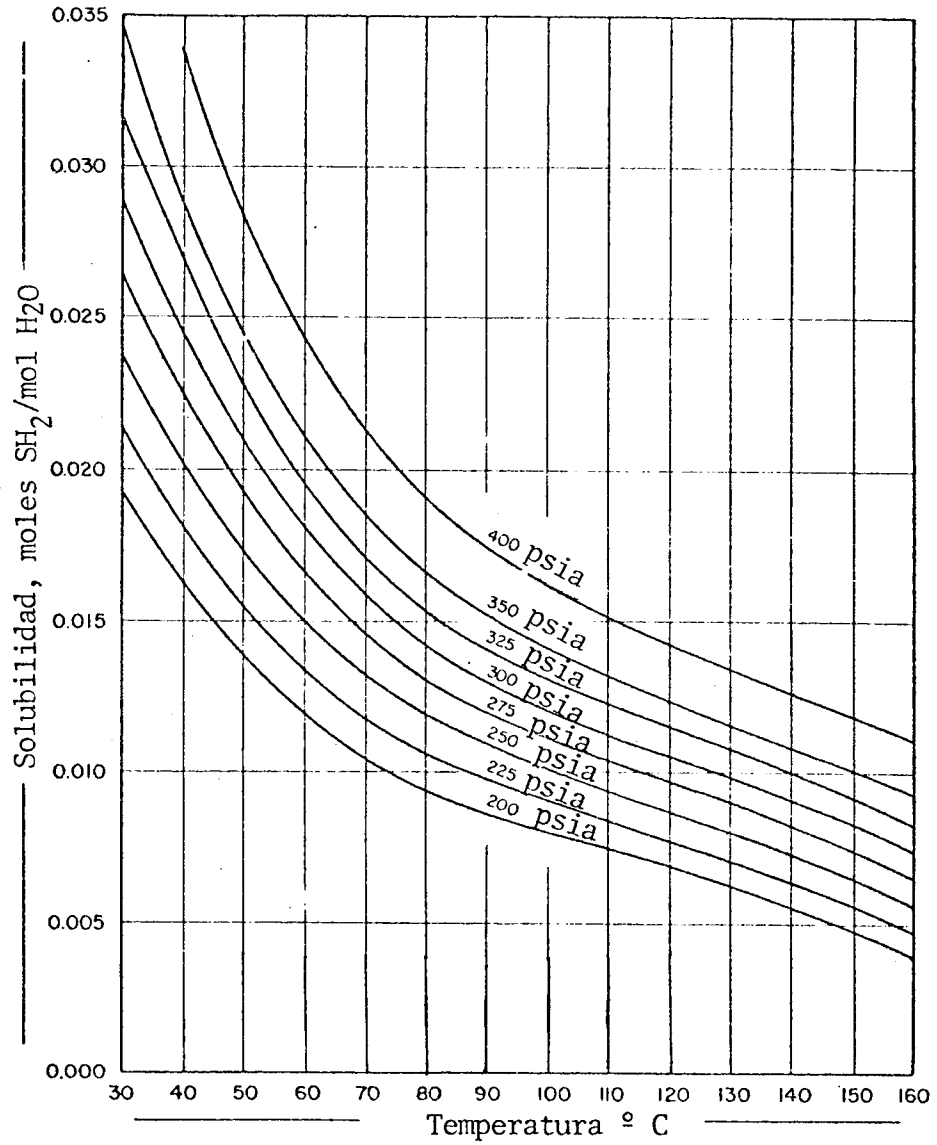
1 vol. de H_2O absorbe 1,08 vol. de gas SH_2 a $10^\circ C$
 1 " " " " 2,53 " " " " " $15^\circ C$
 1 " " " " 3,0 " " " " " $11^\circ C$
 1 " " " " 3,66 " " " " " Temp. amb.
 1 " " " " 4 " " " " " $0^\circ C$ y $p = 760 \text{ mm}$
 1 " " " " 100 " " " " " " " " $p = 820 \text{ mm}$
 1 litro de H_2O disuelve 0,1004 mol de SH_2 a $0^\circ C$ y $p = 760 \text{ mm}$

10-p.130

VOLUMEN DE H_2O A T° QUE ABSORBEN S VOL. DE SH_2 REDUCIDOS A $0^\circ C$ -760 mm.

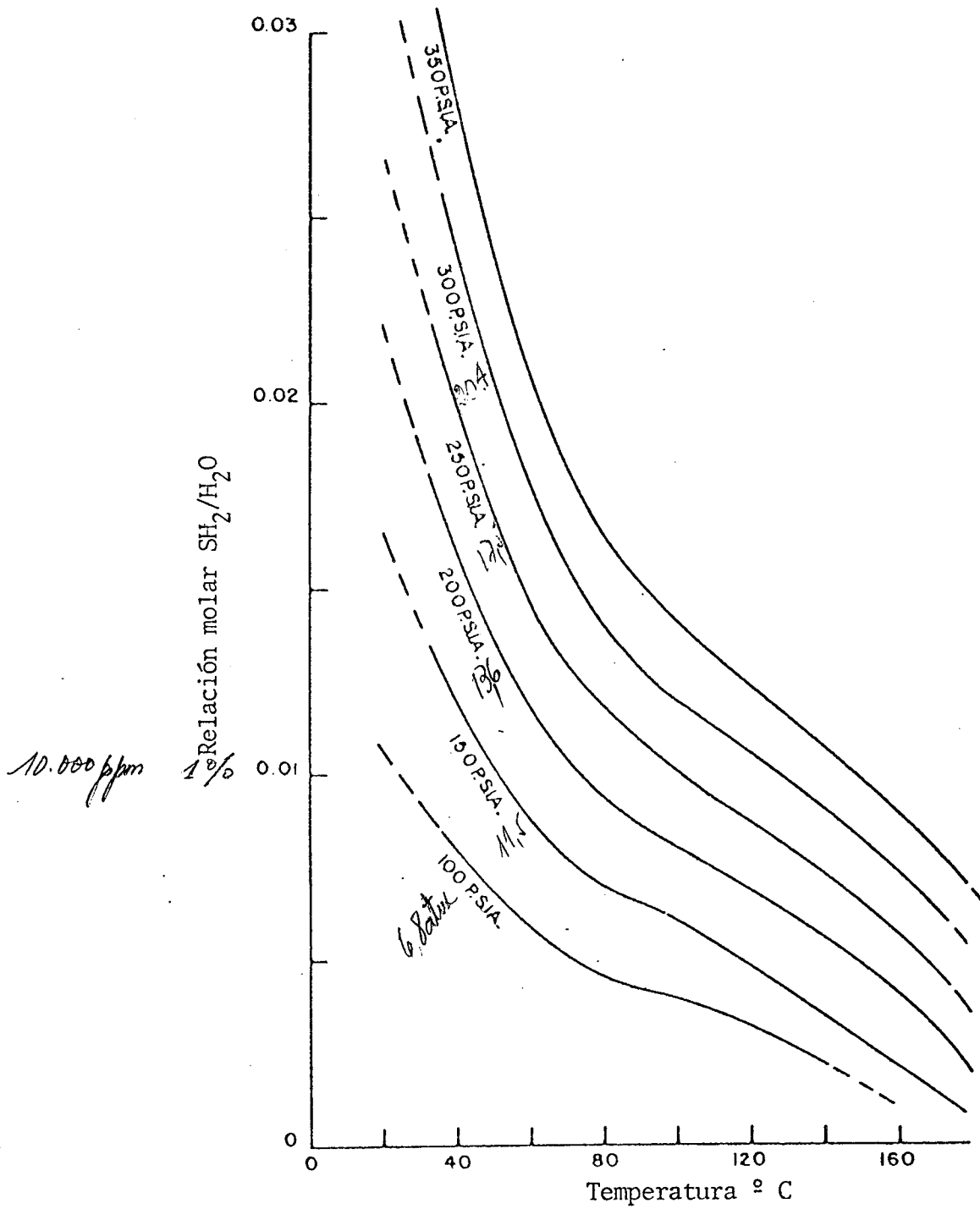
T	0°	5°	10°	15°	20°	25°	30°	35°	40°
S	4,3706	3,9652	3,5858	3,2326	2,9053	2,6091	2,3290	2,0799	1,8569

10-p.131



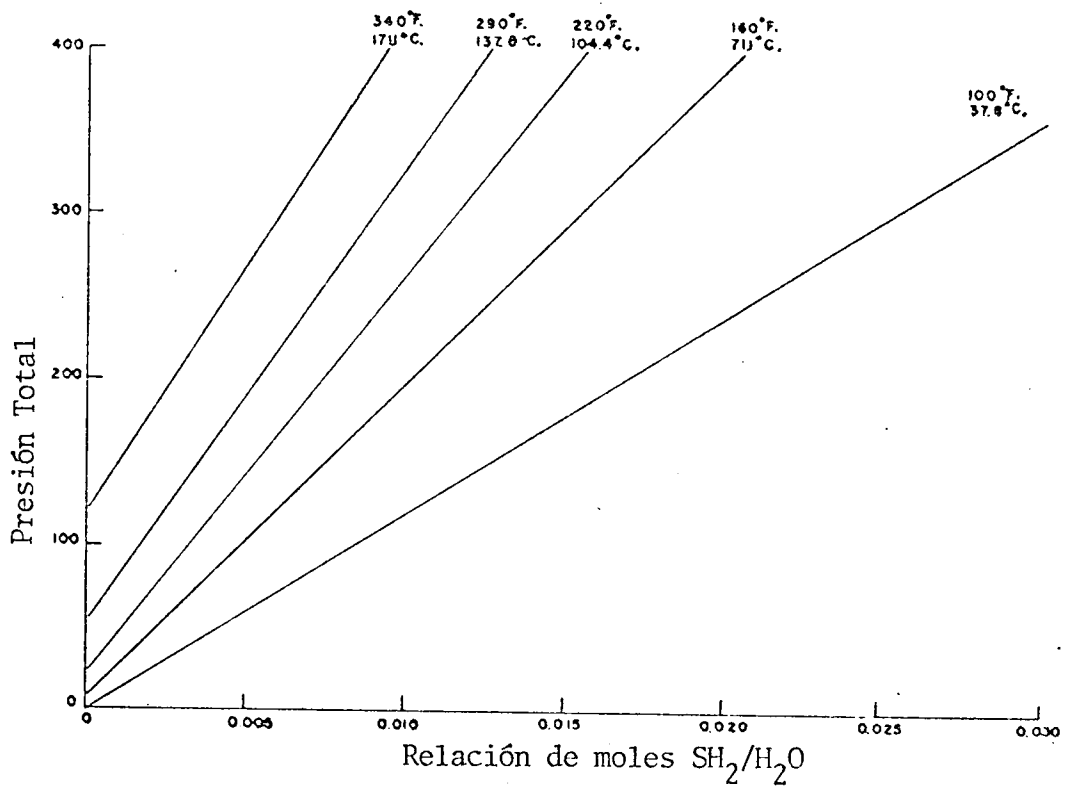
Solubilidad del SH_2 (g) en H_2O (liq.)

3-p.139



Solubilidad del SH_2 en agua.

11-p.520



Solubilidad del SH_2 en agua.

11-p.520

PUNTO DE EBULLICION DEL SH₂

Punto de ebullición	Autores
- 61,8°C (755 mm)	Regnault (1862)
- 60,4°C (755,2 mm)	Ladenburg y Krugel (1900)
- 61 °C (773 mm)	De Forcrand y Fonzes-Diacon (1902)
- 60,1°C	Mc Intosh y Steele (1904)
- 60,2°C	Mc Intosh y Steele (1906)
- 60,2°C	Beckmann (1912)
- 60,2°C	Cardoso y Arni (1912)
- 60,2°C	Baume y Perrot (1914)
- 59,4°C	Maass y Mc Intosh (1914)
- 60,7°C	Klemenc y Bankowski (1932)
212,77°K	Giauque y Blue (1936)
212,7°K	Clusius y Frank (1936)

16-p.969

PUNTO DE EBULLICION DEL SH₂

P mm Hg.	t°C
760	- 73
755	- 61.8
---	- 63.5
755.2	- 60.4
760	- 61.6
---	- 60.1
---	- 59.8
773	- 61
760	- 60.2

10-p.125

TEMPERATURA DE FORMACION DEL SH_2 LIQUIDO Y SU HIDRATO

Presión en psia	Temperatura °C	
	H_2S Hidrato	H_2S líquido
15	1.1	- - -
30	7.5	- - -
50	12.2	- - -
100	18.6	- - -
200	25.0	- - -
300	28.9	- - -
325	29.5	29.5
400	- - -	38.6
500	- - -	48.3
600	- - -	56.1

3-p.39

TEMPERATURA DE LIQUEFACCION DEL SH_2 .

t liquefac.	-70°	-40°	-3,33°	0°	11,11°	18°	50°	100°
P atm.	1,09	2,86	6,36	10,25	14,60	16,95	35,56	88,7

10-p.124

TEMPERATURA DE FUSION DEL SH_2

t°C -85; -83; -83,6; -82,9; -86

10-p.125

t°K 187,6

16-p.967

VISCOSIDAD DEL SH₂ GAS

t°C	$\eta 10^7$ Poises	Autores
0°	1154	Meyer (1871 a 1899)
20°	1300	Meyer (1871 a 1899)
0°	1184	Graham (1849) y Eucken (1913)
0°	1175	Frankine y Smith (1921)
17°	1251	Frankine y Smith (1921)
100°	1610	Frankine y Smith (1921)
23°	1470	Knudsen y Fricke (1940)
0°	1170	Andrussow (1952 y 1953)

16-p.964

TENSION SUPERFICIAL DEL SH₂ LIQUIDO

T°K	189,0°	191,3°	194,6°	197,4°	199,7°
γ dinas/cm	33,418	32,902	32,126	31,645	31,020
γ (MV) ²³ ergs.	349,5	345,3	338,0	334,1	328,3
T°K	201,5°	203,9°	206,9°	210,8°	
γ dinas/cm	30,813	30,448	29,631	28,783	
γ (MV) ²³ ergs.	326,6	324,7	316,7	308,6	

16-p.966

VISCOSIDAD DEL SH₂ LIQUIDO.

T°K	191,0°	193,3°	198,2°	201,2°	206,1°	209,8°
η	0,547	0,528	0,510	0,488	0,470	0,454

16-p.967 y 10-p.123

VOLUMEN CRITICO DEL SH_2 .

0,00490

0,00413

10-p.125

VOLUMEN MOLAR DEL SH_2 .Volumen molecular del SH_2 al p.e. : 35,2

" " " " líquido : 39,53

10-p.123

16-p.966

EFECTO TOXICO DEL H_2S EN EL HOMBRE

ppm.	% H_2S	0-2 min.	2-15 min.	15-30 min.	30 min-1 hora	1-4 horas	4-8 hs.	8-48 hs
50	0,005				Leve conjuntivitis. Irritación del traquea.			
100	0,010				Irritación de garganta.			
100	0,010		Acceso de tos. Irritación de ojos. Pérdida del olfato.	Respiración alterada. Dolor de ojos. Insomnio.	Irritación de garganta.	Descarga de mucus y saliva, agudo dolor en ojos, acceso de tos.	Se incrementan los síntomas.	Hemorragia y muerte.
150	0,015							
200	0,020		Pérdida del sentido del olfato.	Irritación de ojos y garganta.	Irritación de ojos y garganta.	Dificultad de respiración. Visión borrosa.	Serios efectos de irritación.	Hemorragia y muerte.
250	0,025		Irritación de ojos. Pérdida del sentido del olfato.	Irritación de ojos.	Dolorosa secreción de lágrimas. Cansancio.	Catarro nasal. Dolor en ojos. Dificultad de respiración.	Hemorragia y muerte.	
350	0,035							
350	0,035		Irritación de ojos. Pérdida del sentido del olfato.	Irritación de ojos. Dificultad de respiración. Acceso de tos.	Incremento de irritación de ojos y traquea. Dolor sobre todo de cabeza. Cansancio.	Desvanecimiento. Debilidad. Incremento de irritación.	Muerte.	
450	0,045							
500	0,050	Acceso de tos. Colapso. Pérdida del conocimiento.	Disturbios respiratorios. Irritación de ojos. Colapso.	Seriosa irritación de ojos. Palpitación de corazón. Pocos casos de muerte.	Severo dolor de ojos y cabeza. Desvanecimiento. Temblor de extremidades. Gran debilidad y muerte.			
600	0,060							
600	0,060	Colapso	Colapso. Pérdida del conocimiento.					
700	0,070	Pérdida						
800	0,080	del conocimiento.						
1000	0,100	miento.						
1500	0,15	Muerte.						

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