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PROCESS FOR THE PRODUCTION OF AN ALUMINUM-URANIUM ALLOY

Daniel A. Zappi, Sao Paulo, Brazil, assignor to Comision Nacional de Energia Atomica, Buenos Aires, Argentina

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1 Claim. (Cl. 75—122.5)

The present invention refers to a process for the production of aluminum-uranium alloys.

The methods known up to now, for the production of aluminum-uranium alloys consist of:

(1) Mixing the solid metals in open crosslets under reduced pressure and controlled atmosphere.

(2) Mixing solid or molten aluminum with uranium oxide or halides in solid state. Reduction is carried out and subsequently the alloy of the uranium metal with aluminum is formed. If the formed halide is chloride, the $AlCl_3$ so-formed may be removed by sublimation.

(3) Mixing uranium hydrides and uranium oxide and aluminum.

The method which is described in this application, fundamentally consists of introducing a stream of gaseous UF_6 into molten aluminum to obtain a U-Al alloy resulting from the reduction of the UF_6 by the aluminum and from the solution of the uranium into the excess of the aluminum while the slag resulting from the AlF_3 is dissolved in an appropriate fluxing agent and is removed from the molten metal.

This method consists of a single step operation in order to transform UF_6 into U-Al alloy.

In this manner all the intermediary stages which were necessary in order to transform UF_6 into UF_4 or U_3O_8, or UO_2 or UO_3, are avoided. Further, the consequential yield losses and complications inherent in the prior art processes and installations are also avoided.

The absorption of UF_6 into the molten aluminum is quantitative and the yield in this operation is within the range of 99%.

The proportions of the U-Al alloy may be controlled with precise accuracy.

The purity of the obtained alloy is extremely high if pure aluminum is used in an appropriate crosslet, since the UF_6 is usually very pure.

In order to illustrate the invention and without limiting the same to it, the following example is given hereinafter.

Example

In a crosslet made of alumina placed within an electric furnace, 350 grs. of pure aluminum (99.99%) are molten.

The molten metal is coated with a layer of a fluxing agent comprising equal parts of sodium chloride, potassium chloride and sodium fluoride.

Through a tube made of alumina (diameter 10 mm.) a stream of gaseous uranium hexafluoride is introduced under the surface of the molten aluminum at a rate of about 10 g./minute for a period of about 5 minutes.

During the operation the temperature is maintained at about 850° C. When the introduction of uranium hexafluoride is discontinued, the alumina tube is removed and the so-obtained alloy is transferred into a mould.

In this manner 377 grs. of aluminum-uranium alloy are obtained with an uranium content of 9.3%.

The reaction takes place as follows:

$$UF_6+2Al—U+2AlF_3$$

In view of what has been stated above, this method is particularly suitable for the production of fuel elements made of uranium-aluminum with enriched uranium.

I claim:

1. A process for the production of an aluminum-uranium alloy by reducing uranium hexafluoride with an excess of aluminum using a fluxing mixture containing alkaline chlorides, comprising the steps of applying a fluxing mixture of equal parts of sodium chloride, calcium chloride, and sodium fluoride to the surface of a molten mass of aluminum and then introducing gaseous uranium hexafluoride under the surface of said molten aluminum while maintaining the latter at a temperature of about 850° C.

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BENJAMIN R. PADGETT, *Primary Examiner.*

CARL D. QUARFORTH, *Examiner.*

M. J. SCOLNICK, *Assistant Examiner.*