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## A watchmaker's precision at high-pressure reveals CeCu<sub>2</sub>Si<sub>2</sub> and CeAu<sub>2</sub>Si<sub>2</sub> *p*-*T* phase diagrams

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Nearly forty years after the discovery of the first heavy fermion (HF) superconductor, CeCu<sub>2</sub>Si<sub>2</sub>,<sup>1</sup> high-pressure (HP) investigations continue to provide information on the above and also enable the discovery of new Ce-based HF superconductors. Taking advantage of multiprobe HP setups we examined the resistivity, ac-magnetic susceptibility, ac-calorimetry and thermopower of CeCu<sub>2</sub>Si<sub>2</sub> and CeAu<sub>2</sub>Si<sub>2</sub> single crystals up to 27 GPa. We confirmed the existing *p*-*T* phase diagram of the former<sup>2,3</sup> based on bulk properties and found pressure-induced HF superconductivity in the latter. The ac-susceptibility study of CeCu<sub>2</sub>Si<sub>2</sub> up to 5 GPa indicates that the superconducting (SC) transition signature observed from the magnetic field expulsion coincides with the specific heat jump and the zero resistivity. Below *T<sub>c</sub>*, the diamagnetic signal is huge with a signal-to-noise ratio of 10<sup>3</sup> and corresponds to that expected for the sample volume. Thus the pressure dependence of *T<sub>c</sub>* (*T<sub>c</sub>*<sup>max</sup> ≈ 2 K at 4 GPa), follows the bulk transition contrary to what is suggested by a previous report.<sup>4</sup> Furthermore, the broadening of the resistive SC transition in the intermediate pressure range 2 ≤ *p* ≤ 4 GPa results essentially from phenomena linked to the surface quality of the sample as shown by a later investigation.

In the antiferromagnet CeAu<sub>2</sub>Si<sub>2</sub> (*T<sub>N</sub>* ≈ 10K), HP resistivity, ac-calorimetry and thermopower measurements revealed a highly unusual interplay between superconductivity and magnetism. We recently reported on pressure-induced superconductivity with *T<sub>c</sub>*<sup>max</sup> ≈ 2.5 K near *p<sub>c</sub>* ≈ 22.5 GPa occurring deep inside the antiferromagnetic phase and over a broad pressure range from 11.8 to 26.5 GPa leading to a giant overlap of the magnetic and pressure-induced SC phases.<sup>5</sup> In addition, both the bulk *T<sub>c</sub>* and *T<sub>N</sub>* are strongly enhanced (by a factor 2) with increasing pressure from 16.7 to 20.2 GPa. Subsequently we were also able to reveal a magnetic structure rearrangement below *T<sub>N</sub>* which follows *T<sub>c</sub>* and is strongly enhanced at *p<sub>c</sub>* when *T<sub>N</sub>* vanishes.

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