Tuning of superconductivity and magnetic order of heavy fermion $CePt_3Si$ by substitution and pressure

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$CePt_3Si$ is a novel unconventional superconductor (SC) which undergoes a transition into an antiferromagnetic ground state at T_N ~ 2.2 K and exhibits superconductivity below 0.75 K. $CePt_3Si$ crystallizes in the tetragonal structure P4mm which lacks a center of inversion. Large values of H_{c2}' ~ -8.5 T/K and $H_{c2}(0)$ ~ 5 T were derived, referring to Cooper pairs formed out of heavy quasi-particles. The mass enhancement originates from Kondo interactions with a characteristic temperature T_K ~ 8 K. $CePt_3Si$ follows the general features of correlated electron systems and can be arranged within the Kadowaki-Woods plot next to the unconventional SC UPt_3. NMR and μSR results show that both magnetic order and SC coexist on a microscopic scale without having spatial segregation of both phenomena. The absence of an inversion symmetry gives rise to a lifting of the degeneracy of electronic bands by spin-orbit coupling. As a consequence, the SC order parameter may have uncommon features as indicated from a very unique NMR relaxation rate $1/T_1$ and a linear temperature dependence of the penetration depth λ.

The aim of the present work is to trace the evolution of superconductivity and magnetic order upon the application of hydrostatic pressure; changes originated by hydrostatic pressure will be compared with results of measurements performed on substituted samples, where the exchange of elements, such as Si/Ge causes chemical pressure effects.

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