Magnetic Field Response of Superconducting $CeCoIn_5$

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Magnetic field stabilizes a novel phase in the High-Field-Low –Temperature (HFLT) corner of the superconducting phase in $CeCoIn_5$, originally suggested as a possible realization of the spatially inhomogeneous Fulde-Ferrel-Larkin-Ovchinnikov (FFLO) superconducting phase, predicted in early 1960's. Recent NMR measurements revealed presence of the long range antiferromagnetic (AFM) order. Neutron diffraction measurements recently established the nature of the magnetic order with magnetic field along [110]. We investigated the effect of Cd, Hg[1], and Sn doping on the superconducting (SC) transition temperature T_c, the superconducting critical field H_{c2}, and the HFLT phase. T_c decreases monotonically for both dopants, whereas H_{c2} rises initially with Hg & Cd substitution, while dropping for Sn doping. In spite of this opposite trends, T_{HFLT} scales with T_c at the same field for both Sn and Hg doping. We interpret these results as supporting the superconducting origin of the HFLT phase, and suggest a possible scenario of the interplay between AFM and FFLO orders.

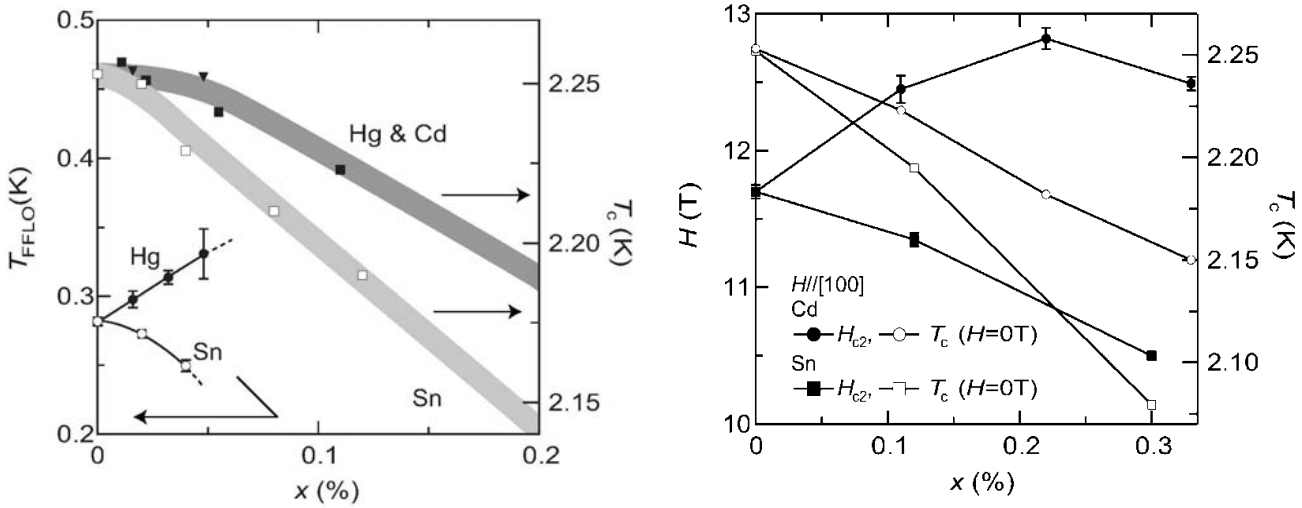

Figure 1: Right: while T_c is suppressed by Cd and Sn impurities, T_{HFLT} seems to be enhanced (suppressed)by Hg (Sn); this behavior is in concert with response of H_{c2} to impurities, which rises (declines) for Hg (Sn).

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