Study of Ni-Pd substitution in $UNi_xPd_{2-x}Al_3$ system

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UNi_2Al_3 and UPd_2Al_3 have the same crystal structure belonging to the space group $P6/mmm$ and are 'isoelectronic' in the sense that Ni and Pd lie in the same column of the periodic table. These heavy fermion systems behave differently on a microscopic level as regards their magnetism, while the superconducting properties are qualitatively similar. UPd_2Al_3 orders into a simple antiferromagnetic structure with a substantial magnetic moment $\sim 0.8\ \mu_B$/U below $T_N \sim 14.3$K and then exhibits superconductivity below $T_c \sim 2$K. UNi_2Al_3 enters an incommensurate spin-density-wave state with magnetic moment $\sim 0.2\ \mu_B$/U below $T_N \sim 4.5$K and becomes superconducting below $T_c \sim 1$K. Comparative studies of the electronic structures in the two compounds may help elucidate where these differences come from. It was anticipated that only because of small differences in the band structures between the Pd and the Ni compounds is the magnetic ground state incommensurably ordered in UNi_2Al_3, while it is commensurate in UPd_2Al_3. A tuning of the electronic structure by substitution Pd with Ni and subsequent study of magnetic and electronic properties of $UNi_xPd_{2-x}Al_3$ system is main goal of our study performed on polycrystalline samples with x = 0.5 and 1.5.

9.7 cm

13.4 cm

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