Evolution of a non-Fermi-liquid state in the pseudo-ternary solid solutions $URu_{1-x}Pd_xGe$

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X - ray diffraction, dc-magnetization M, magnetic susceptibility $\chi(T)$, specific heat $C_p(T)$, and electrical resistivity $\rho(T)$ were performed on $URu_{1-x}Pd_xGe$. The investigated solid solutions crystallize in the orthorhombic TiNiSi - type structure (space group Pnma). We found that the alloys with $x \leq 0.32$ are nonmagnetic down to 2 K, whereas these with $0.35 \leq x \leq 0.8$ are antiferromagnetic. The Néel temperature of the latter pseudo-ternaries attains its maximum value of 32 K at $x = 0.8$. The composition $x = 0.9$ manifests two magnetic phase transitions: antiferromagnetic at T_N= 20 K and ferromagnetic at $T_C = 30$ K. Remarkably, the compositions located closer to the nonmagnetic-magnetic border ($x \sim 0.3$), exhibit $\chi(T) \propto T^{0.53}$, $C_p(T) \propto \ln T$ and $\rho(T) \propto T^{1.2}$, respectively. The finding has been interpreted in terms of non-Fermi liquid properties nearby a quantum critical point. The development of magnetism in $URu_{1-x}Pd_xGe$ corresponds well to changes in the degree of $5f$ electron localization.

The work was supported by the National Science Centre (Poland) under the Grant No. 2011/01/B/ST3/04553.