High-field magnetisation and magnetoresistance of U_3P_4 and its solid solution $U_3(P,As)_4$

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9.7 cm

We studied magnetisation and longitudinal magnetoresistance of single-crystal samples of two compositions: stoichiometric compound U_3P_4 and its solid solution $U_3(P,As)_4$ (with As:P ratio close to 1) in pulsed magnetic fields with strength up to 47 T, and in temperatures from 4K up to few tens of Kelvins above Curie temperatures (135 K and 150 K for both compositions, respectively). Field was applied in hard magnetic direction [100] (easy one is [111] for both compositions). Magnetisation experiments showed no sign of expected metamagnetic transition (similar to that observed for U_3As_4, at $\approx$20 T and 4 K) either for U_3P_4 or for $U_3(P,As)_4$ and data look quantitatively similar. On the other hand, longitudinal magnetoresistance (MR) is remarkably different for each composition. First it has opposite signs, and moreover strongly nonlinear form of MR(B) curves for $U_3(P,As)_4$ is strikingly dissimilar to these for U_3P_4. Onset of the above mentioned transition can be held responsible for broad maxima observed in MR(B) curves for $U_3(P,As)_4$. Values of magnetic field strength corresponding to these maxima clearly follow a linear dependence on temperature. We assume that such a bending of MR(B) curves is due to the deformation of magnetic structure of $U_3(P,As)_4$ in high magnetic fields.

13.4 cm

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