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

P. Wiśniewski$^a$, N. Kozlova$^b$, J. Freudenberger$^b$ and Z. Henkie$^a$

$^a$Institute of Low Temperature and Structure Research PAS, Wroclaw, Poland
$^b$IFW Dresden, Institute for Metallic Materials, Dresden, Germany

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 4 K 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.

Subject category:
3. Magnetic Structure and Dynamics

Presentation mode:
poster

Corresponding author:
Piotr Wiśniewski

Address for correspondence:
Institute of Low Temperature and Structure Research PAS, PNr1014, 50-950 Wroclaw, Poland

Email address:
P.Wisniewski@int.pan.wroc.pl