

Single crystal growth and magnetic properties of a uranium filled skutterudite $\text{UFe}_4\text{P}_{12}$

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We have succeeded in growing single crystals of a uranium filled skutterudite $\text{UFe}_4\text{P}_{12}$ and measured the magnetic properties. The previous report indicates that $\text{UFe}_4\text{P}_{12}$ is an insulator but a ferromagnet with a Curie temperature $T_C = 3.1$ K [1].

Single crystals of $\text{UFe}_4\text{P}_{12}$ were grown by the Sn-flux method. The constitutional elements with U:Fe:P:Sn = 1: 4: 20 : 50 were inserted in an aluminum crucible and sealed in a quartz tube, which was heated up to 1050°C and cooled down with a rate of 1°C/hour, taking one month in total. Figure 1 shows a single crystal with $1.5 \times 1.5 \times 1.5$ mm³. The flat planes correspond to the (100), (110), (111), and (130) planes.

The field dependence of magnetization is shown for magnetic fields along [100], [110], and [111] directions. These results indicate that an easy-axis corresponds to [100]. The magnetic moment is $0.8\mu_B/\text{U}$.

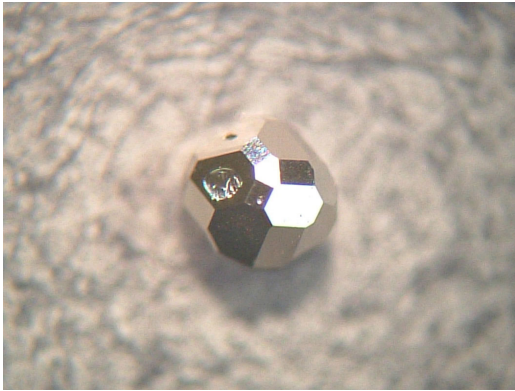


Figure 1: Single crystal of $\text{UFe}_4\text{P}_{12}$.

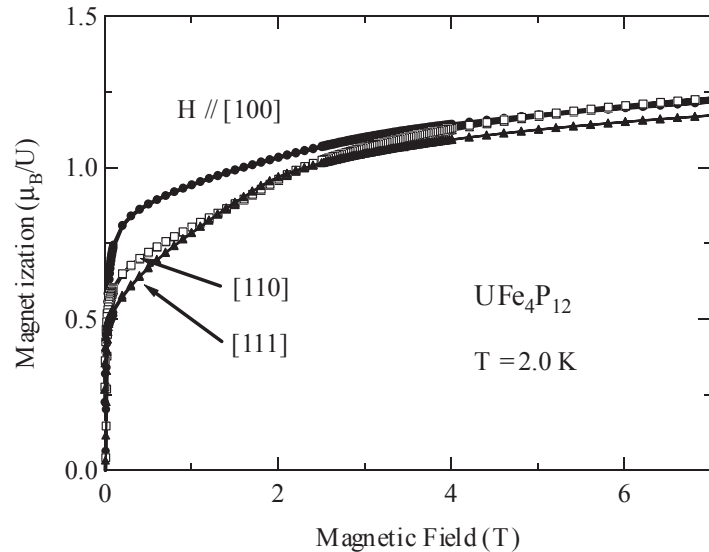


Fig. 2 Magnetization curves of $\text{UFe}_4\text{P}_{12}$.

[1] R.P. Guertin, C. Rossel, M.S. Torikachvili, M.W. McElfresh, and M.B. Maple, Phys. Rev. B **36** (1987) 8665.