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Sample preparation and physical properties of U- and Th-based skutterudite compounds

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Uranium-based skutterudite $\text{UFe}_4\text{P}_{12}$ has been studied by means of high-quality single crystal growth, magnetization, resistivity and NMR experiments. Single crystals have been obtained by the Sn-flux method. Semiconducting behavior as well as ferromagnetism at low temperature have been observed as reported in the previous study [1]. ^{31}P -NMR spectra for the single crystalline $\text{UFe}_4\text{P}_{12}$ [2] indicate that uranium atoms occupy regular positions without defects, indicating high-quality of the present single crystal. Magnetic susceptibility up to 800 K, high-field magnetization and specific heat data are analyzed in detail based on the $5f^2$ crystal field scheme. Two level schemes, namely, (1) Γ_1 ground state and the $\Gamma_4^{(2)}$ separated by 6 K or (2) the $\Gamma_4^{(2)}$ triplet ground state successfully explain the small saturation moment and low-temperature entropy.

In order to extend our study, following experiments are in progress.

- Search for new uranium-based skutterudites
- Preparation of ^{235}U -enriched sample for NMR study
- Preparation of Th-skutterudites

[1] R.P. Guertin *et al.*, Phys. Rev. B **36** (1987) 3665.

[2] Y. Tokunaga *et al.*, PS11 in this conference.