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Search for New Compounds corresponding to Pr-based Skutterudites

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We have studied several Pr-based compounds. One of the typical compounds is PrCu_2 with the orthorhombic crystal structure which presents the field-induced ferroquadrupolar ordering due to O_2^2 [1]. A cubic crystal PrPb_3 also indicates antiferroquadrupolar ordering below 0.4 K. The cyclotron mass starts to increase gradually with decreasing the temperature below 1 K [2]. A Kondo effect with antiferromagnetic ordering is found in PrSn_3 [3]. The cyclotron mass in PrSn_3 is about one order larger than the corresponding cyclotron mass in LaSn_3 . Both the quadrupolar ordering and the Kondo effect are combined in Pr-based skutterudites such as $\text{PrFe}_4\text{P}_{12}$. The cyclotron mass close to $100m_0$ is observed in $\text{PrFe}_4\text{P}_{12}$.

We have started to search for new heavy fermion Pr-based compounds. Single crystals of PrCoIn_5 , PrRhIn_5 and PrIrIn_5 with the tetragonal structure, and $\text{Pr}_3\text{Co}_4\text{Sn}_{13}$ and $\text{PrRh}_4\text{Sn}_{13}$ with the cubic structure were grown. These compounds are found to be non-magnetic, most likely possessing the singlet $4f$ -ground state.

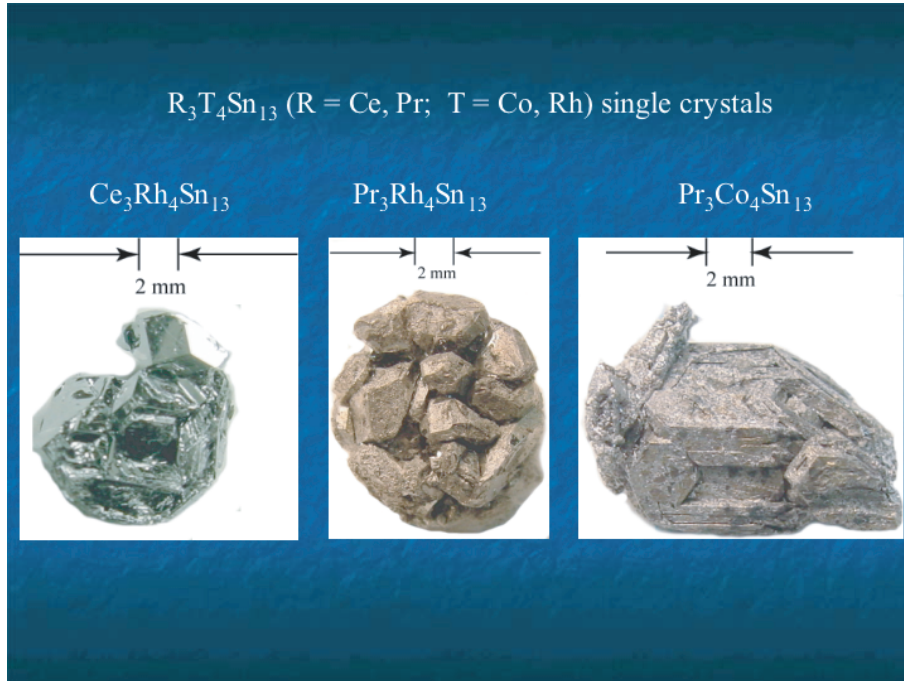


Figure 1: Single crystals of $\text{R}_3\text{T}_4\text{Sn}_{13}$ ($\text{R}=\text{Ce, Pr}$; $\text{T} = \text{Co, Rh}$).

- [1] R. Settai *et al.*, J. Phys. Soc. Jpn. **67** (1998) 636.
- [2] D. Aoki *et al.*, JJAP Series11 (1999) 188, T. Tayama *et al.*, J. Phys. Soc. Jpn. **70** (2001) 248.
- [3] R. Settai *et al.*, J. Phys. Soc. Jpn. **69** (2000) 3983.