(PS43)

Single crystal growth of filled-skutterudite Np compounds and Fermi surfaces in $NpRhGa_5$

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The recent discovery of superconductivity in $PuCoGa_5$ and $PuRhGa_5$ reveals that it is important to study the transuranium compounds including Pu and Np. Nevertheless it is very difficult to treat transuranium compounds experimentally because of the high radio activity and requirements of special equipment and technique.

We succeeded in growing a high quality single crystal of $NpRhGa_5$ by the Ga-flux method and observed the de Haas-van Alphen (dHvA) oscillations in the antiferromagnetic state. Figure 1 shows the angular dependence of the dHvA frequency in $NpRhGa_5$. Four kinds of nearly cylindrical Fermi surfaces, which correspond to main Fermi surfaces, were clearly detected. These quasi-two-dimensional Fermi surfaces are formed in the flat antiferromagnetic Brillouin zone and are well explained on the basis of the spin- and orbital-polarized LAPW energy band calculations. The cyclotron effective masses are moderately enhanced, ranging from 8.1 to 11.7 m_0, which are approximately four times larger than the corresponding band masses. This is the first case where the $5f$-itinerant band model is applicable to the neptunium magnetic compound.

We also report the current status of the project on the filled-skutterudite Np compounds. Figure 2 shows the photograph of UFe_4P_{12} which was grown by the Sn-flux method in order to prepare the single crystal growth of Np compounds.

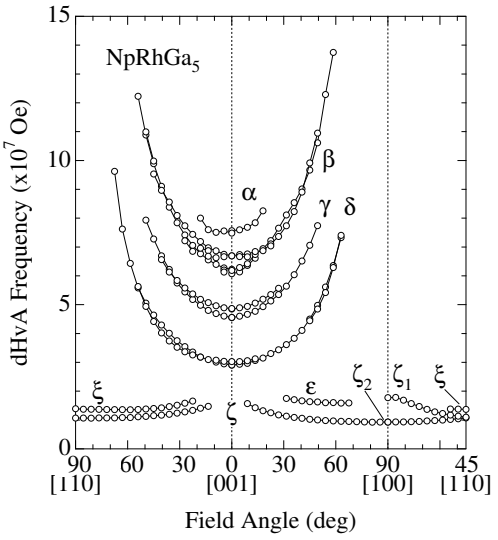

Figure 1: Angular dependence of the dHvA frequency in the antiferromagnetic state of $NpRhGa_5$.

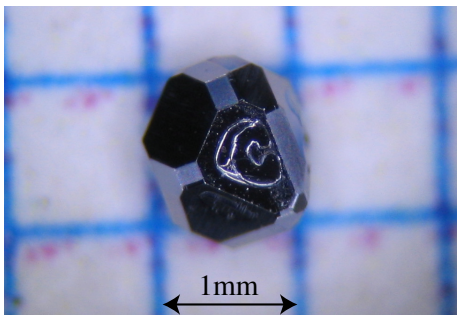

Figure 2: Photograph of UFe_4P_{12} single crystal.