

(PS3)

High pressure synthesizing of light rare earth skutterudites including As

T. Namiki, C. Sekine, J. Hayashi, K. Kihou, and I. Shirotnani

Faculty of Engineering Science, Muroran Institute of Technology

Filled skutterudites RT_4X_{12} (R; rare earth, T; Fe, Ru, Os, X; P, As, Sb) is known to show the various novel physical properties such as superconductors, heavy fermions, and metal-insulator transition. It is due to the recent improvement of growing high quality samples using the flux method. To realize these novel properties, systematic studies for filled skutterudites are important. Among them, no filled skutterudites including As are grown by this method due to the severe conditions to grow sample. On the other hand, the experimental results are reported for a few filled skutterudites including As that $LaRu_4As_{12}$ and $PrRu_4As_{12}$ are the superconductors with the critical temperature $T_c = 13.3$ K and 2.3 K. The T_c of $LaRu_4As_{12}$ is the highest temperature in the filled skutterudites. These results are interesting and indicate that the high pressure synthesizing method is available for growing filled skutterudites including As.

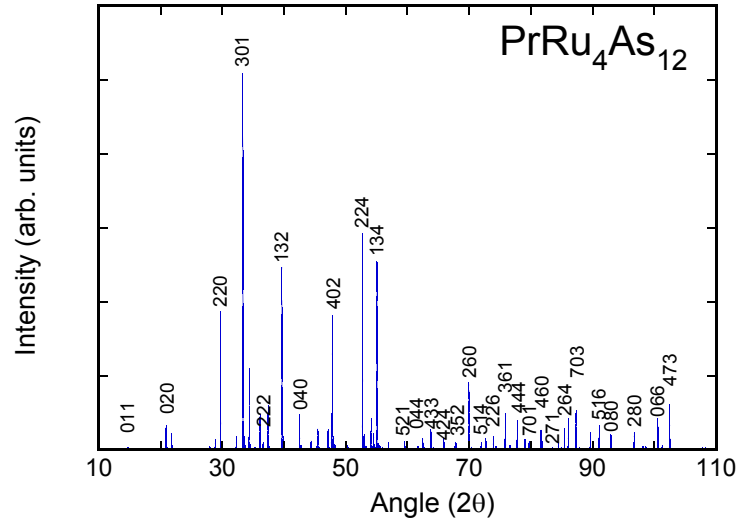


Figure 1: X-Ray diffraction profile of $PrRu_4As_{12}$ prepared by high pressure synthesizing method.

Figure 1 shows the X-Ray diffraction pattern of the $PrRu_4As_{12}$ grown by high pressure synthesizing method. As shown in figure 1, main peaks are identified as $PrRu_4As_{12}$, indicating that $PrRu_4As_{12}$ was grown by this method. However, the existences of some other unidentified peaks indicate the inclusion of some impurities. Actuary, compared to the other samples grown by same method [2], many unidentified peaks are observed for $PrRu_4As_{12}$. It suggests the severe conditions to grow the high quality sample.

[1] I. Shirotnani *et al.*: Phys. Rev. B **56** (1997) 7866.

[2] C. Sekine *et al.*: Science and Technology of High Pressure, ed. M. H. Manghnani, W. J. Nellis and M. F. Nicol (Universities Press, Hyderabad, India, 2000) p. 826.