(P2-9)

X-ray diffraction study on pressure-induced insulating phase in $PrFe_4P_{12}$

D. Kawana[1], K. Kuwahara[1], Y. Aoki[1], M. Kohgi[1], H. Sato[1], H. Sagayama[2], T. Osakabe[3], K. Iwasa[4] and H. Sugawara[5]

[1]Department of Physics, Tokyo Metropolitan University, Hachioji 192-0397
[2]Institute of Materials Structure Schience, KEK, Tsukuba 305-0801
[3]QuBS, Japan Atomic Energy Agency, Tokai, Ibaraki 319-1195
[4]Department of Physics, Tohoku University, Sendai 980-8578
[5]Faculty of Integrated Arts and Sciences, Tokushima University, Tokushima 770-8502

The filled skutterdite $PrFe_4P_{12}$ shows the pressure-induced metal-insulator (M-I) transition above 2.4 GPa.[1] We have investigated the insulating state from a viewpoint of the crystal structure. As the result, a drastic change in lattice constant is observed.

Figure 1 shows the scans through $\boldsymbol{Q}$=(3,0,21) Bragg peak under 2.8 GPa at various temperatures. One Lorenzian-like peak, which is seen in the paramagnetic phase, remains down to 6 K. In contrast, another peak corresponding to the low-temperature ordered phase appears and develops below 8 K. The two phases coexist at around the temperature below which the resistivity increases rapidly. This observation clearly indicates the M-I transition to be a true first-order phase transition accompanied by a large jump in lattice constant. In the insulating phase, the symmetry is found to be lowered from cubic to orthorhombic or lower.

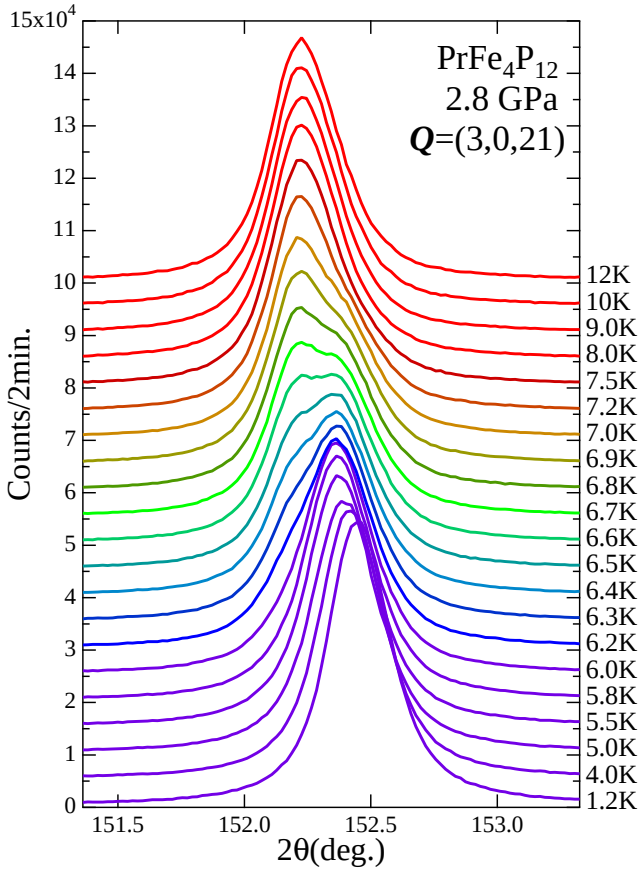

Figure 1: (Color online) Longitudinal-scan profiles through the Bragg reflection $\boldsymbol{Q}$=(3,0,21) at various temperatures under 2.8 GPa. The profiles are obtained with heating temperature.

[1]H. Hidaka *et al.*:Phys. Rev. B **71** (2005) 073102.