(PS13)

Pressure effect on lattice anomaly of $PrFe_4P_{12}$

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The filled skutterudite $PrFe_4P_{12}$ undergoes antiferro-quadrupolar(AFQ) ordering below T_Q=6.5K. In this ordering, lattice distortion occurs mainly due to the displacement of Fe-ion, and the superlattice reflections characterized by a wave vector $\boldsymbol{q}$=(1,0,0) are observed by X-ray diffraction.[1] Recently, it is found by the measurement of the resistivity under high pressure that T_Q is suppressed with applied pressure and that an insulating phase appears at about 2.4GPa.[2] We study the pressure effect on a variation of crystal structure and P-T phase diagram from the microscopic viewpoint by X-ray diffraction.

Figure 1 shows temperature dependence of (700) superlattice reflection intensity at 1.4GPa. T_Q is suppressed to 5.5K as is similar to the behavior of the resistivity, but as shown in fig. 2, the saturation value of Fe-ion displacement δ at the lowest temperature is about 2.0×10^{-4} for lattice constant which is almost same as at ambient pressure. This result corresponds to the unchanged magnitude of a gap on Fermi-surface in the AFQ phase under high pressure. The measurement under higher pressure is now progressing, clarifying whether or not the AFQ phase remains in the insulating phase.

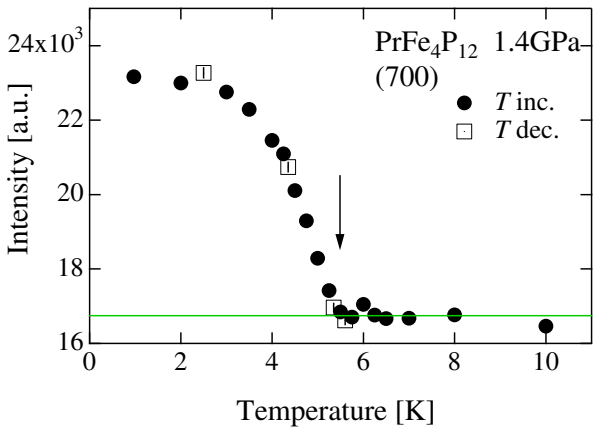

Figure 1: Temperature dependence of superlattice reflection intensity at 1.4GPa.

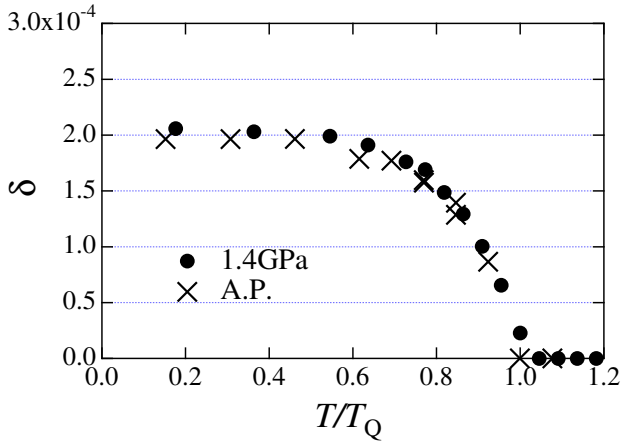

Figure 2: Temperature dependence of Fe-ion displacement, δ.

[1] K. Iwasa *et al.*: Physica B **312-313** (2002) 834.
[2] H. Hidaka *et al.*: JPS meeting (2004)