# Magnetic frustration in the $ABC_6$-type ordered alloy Pt-Mn

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Pt-Mn alloys form the $ABC_6$-type atomic ordered structure with *Fm*-3*m* symmetry for Mn concentration just between 12 ~ 15 at%[1]. In the $ABC_6$-type atomic order, Mn atoms form fcc structure and magnetic moments order to long-ranged type-III antiferromagnetic structure characterized by a propagation wave vector $k$ = (1,1/2,0) below $T_N$ ~ 20 K[2]. Above $T_N$ up to around $4T_N$, magnetic diffuse scattering appears at an incommensurate wave vector k = (1,$\delta$,0), where $\delta$ gradually shifts close to the commensurate value 1/2 as temperature decreases to $T_N$. Quite similar magnetic behavior has been observed in the magnetic scattering of the cubic pyrite magnetic semiconductor $MnS_2$[3]. Detailed studies of the incommensurate magnetic scattering in $MnS_2$ have revealed that the value of $\delta$ jumps abruptly to the commensurate 1/2 at $T_N$. Recently, the structure of $MnS_2$ was re-examined using very high resolution synchrotron X-ray diffraction, and symmetry lowering from *Fm*-3*m* to *Pbca* due to a very subtle lattice distortion was observed below $T_N$[4]. It is greatly expected that the type-III antiferromagnetic order is formed through a common mechanism of the incommensurate-commensurate lock-in transition triggered by a spin-lattice coupling. To ensure that the type-III antiferromagnetic order in Pt-Mn alloys is also formed through the incommensurate-commensurate lock-in transition, temperature dependence of the magnetic scattering was investigated thoroughly using four-circle neutron diffractometer FONDER installed at T22 port in JRR-3. A cylindrical single crystal of $Pt_{85.6}Mn_{14.4}$ with the size of about 10 mm height and diameter has been measured. Figure 1 shows temperature dependance of the peak positions and intensities of the incommensurate diffuse scattering. The peak positions deviates from 1/2 above $T_N$, but the deviations are very small (~ 0.01), and above $2T_N$, it is difficult to derive accurate values because the broadening of the diffuse scattering becomes quite pronounced. Further study for measurements with much high statistics is necessary.

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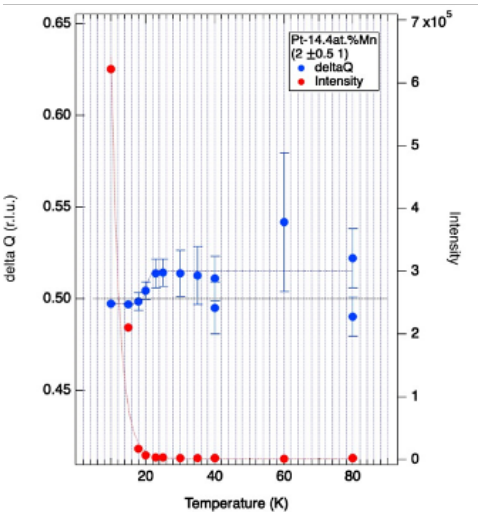


Fig. 1. Temperature dependance of peak positions and intensities of the diffuse scattering above $T_N$.