

Spin Waves in MnP

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Manganese phosphide MnP is a ferromagnetic intermetallic compound below $T_C = 291\text{K}$, and it transforms into a proper screw state at $T^* = 47\text{K}$.

The crystal structure is a slightly distorted NiAs structure with the lattice parameters of $a = 5.916$, $b = 5.260$, $c = 3.173$ at room temperature. In the ferromagnetic state, the easy-axis of the magnetization is the c-axis. In the proper screw state, the spin rotates in the b-c plane with a propagation vector $\mathbf{q} = 0.117a^*$ along the a-axis. One of our interests of MnP is the mechanism of transition from ferromagnetism to helimagnetism which had not been explained by theoretical viewpoint. In order to elucidate the mechanism, the information of spin wave in the whole Brillouin zone is crucially important.

The ferromagnetic spin-waves along the three principal axes had been measured by Todate et al[1]. They reported that the dispersion relation along the a-axis exhibits anomalous wave vector and temperature dependence, and also the quadratic q dependence was observed both along the b- and c-axes. In the proper screw state, spin-waves along the a- and b-axes had been measured by Tajima et al[2]. They reported the anomalous jump around T^* along the a-axis which may be related to 3 .

We performed the neutron inelastic scattering experiments at triple-axis spectrometer TOPAN (6G), JRR-3M reactor in JAERI (Tokai).

The single crystal of MnP, whose size is $9\text{mm} \times 40\text{mm}$, was grown by the Bridgman method.

The spin wave dispersions have been measured along the a-axis at 14 K, 35K, 54K and 81K, as shown in Fig1. The dispersion curve below T^* , there seems to be two lines. However, the indicated lines by an arrow

are arised from another Brillouin zone.

In order to obtain the spin waves in the whole Brillouin zone, further measurements of spin waves at higher energy ($\sim 100\text{meV}$) and lower energy ($0 \sim 2$ meV) are now in progress.

References

- [1] Y Todate et al.: Jou Phys Soc Jpn. 56 36 (1987).
- [2] K Tajima et al.: Jou Mag Mag Mat. 15-18 373-374 (1980).

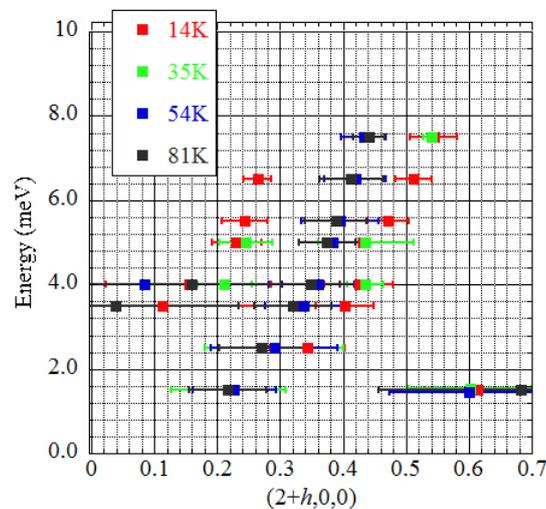


Fig. 1. Spin wave relations along the a-axis