

Spin Waves in MnP

S. Yano(1), Y. Kousaka(1), M. Nishi(2), M. Matsuura(2), K. Hirota(2) and J. Akimitsu(1)

(1)Department of Physics and Mathematics, Aoyama-Gakuin Univ., 5-10-1 Fuchinobe, Sagamihara, (2) Institute for Solid State Physics, The Univ. of Tokyo 106-1 Shirakata, Tokai 319-1106

Manganese phosphide MnP is a ferromagnetic intermetallic compound below $T_C = 291\text{K}$, and it transforms into a proper screw spiral 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 spiral state, the spin rotates in the b-c plane with a propagation vector $0.117a^*$ along the a-axis.

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 dependences, and also the quadratic q dependence was observed along both the b and c-axis. However, the measurements were taken only in ferromagnetic state, so that the information about the spiral state is still missing.

In order to elucidate the mechanism of the spiral state, the information of spin wave in the whole Brillouin zone is crucially important. We focus our attention on the spin wave dispersion of the spiral state in MnP, in order to investigate the magnetic mechanism of the spiral state.

We performed the neutron inelastic scattering experiments at triple-axis spectrometer PONTA (5G), JRR-3M reactor in JAERI (Tokai).

The single crystal of MnP, whose size is length 40mm \times diameter 9mm was grown by the Bridgman method.

The measurements were taken at 18 K, as shown Fig1 and Fig2, the spin wave dispersions have been measured along the a- and b-axis. From these experimental results, however, it is difficult for to ob-

tain the precise exchange parameters of magnetic interaction. Additional measurements are needed to determine the magnetic exchange parameters.

Further measurements of spin waves at large-q and region are now in progress.

References

[1] Y Todate et al.: Jou Phys Soc Jpn. 56 36 (1987).

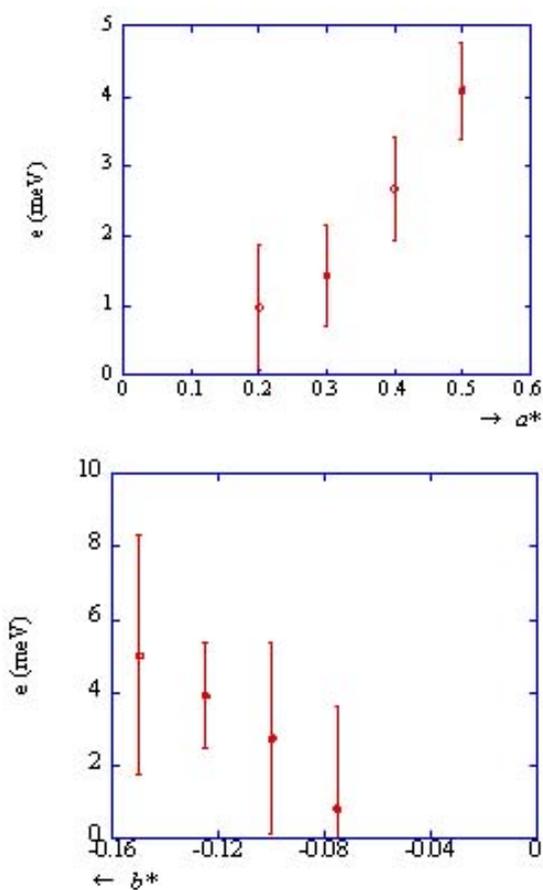


Fig. 1. Spin wave relations along the a- and b-axis