Magnetic Structure of CrB2 in Magnetic Field

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CrB2 is an itinerant anti-ferromagnet with TN = 88 K, of which crystal structure is AlB2-type (P6/mmm).

In the magnetically ordered state of CrB2, a cycloidal magnetic structure, in which the magnetic moments of 0.5 μ B turn in the c*-[110] plane with the propagation vector of 0.285[110], was proposed by Funahashi et al[1]. However, NMR data is inconsistent with the cycloidal model, Spin echo 11B NMR spectra suggest commensurate structure[2]. Why the inconsistent data are obtained between NMR and neutron data? NMR experiments were performed with magnetic field however, neutron diffraction experiments were performed without magnetic field.

Therefore, in order to obtain the consistent data of CrB2, we performed the neutron diffraction experiments with an applied magnetic field at 3 circle diffractometer PONTA (5G), JRR-3M reactor in JAERI (Tokai).

The single crystals of CrB2, whose size are length 22 × diameter 5 [mm3] and length 7 × diameter 5 [mm3] were grown by the conventional floating zone method with Ar atmosphere, using enriched 11B to avoid the large neutron absorption due to 10B.

The measurements were taken at 1.8 K and applied magnetic field up to 5.9T. We applied magnetic field along the [001] and [1-10] axes, and observed (hh0). As shown Fig1, the propagation vector and scattering intensity did not change along the [001] axis by changing the magnetic field, and also along the [1-10] axis. We concluded that the magnetic structure did not change against the magnetic fields up to 5.9T. The result shows commensurate 120 °state might be stabilized with larger magnetic field.

In conclusion, we have determined the cycloidal magnetic structure under magnetic field up to 5.9T.

References

[1] S. Funahashi et al.: Solid State Commun. 23 859 (1977).
[2] To be published.

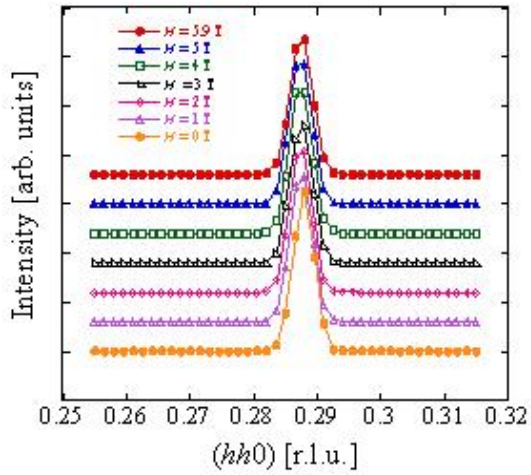

Fig. 1. Observed intensity at 1.8K,H//[001]