Determination of the magnetic structure in weak ferromagnetic superconductor Tb0.47Y0.53Ni2B2C

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Tb0.47Y0.53Ni2B2C is a system to show a coexistence state between the weak ferromagnetism and the superconductivity and, in such a coexistence state, one can expect to have a " spontaneous vortex phase " by an internal magnetic field mediated by the ferromagnetic components [1,2]. It is one of the issues that have not been confirmed yet. In Tb0.47Y0.53Ni2B2C, weak ferromagnetic transition temperature Twfm is higher than superconducting transition temperature Tc. With such a system, one can investigate the occurrence of the spontaneous phase without being affected by pinned vortexes.

In previous experiments, weak ferromagnetic order is confirmed below 4 K by polarized neutron diffraction experiments at HB-1 HFIR in ORNL and its magnetic structure in antiferromagnetic phase under zero magnetic field is determined as a spin density wave with a propagation vector q = 0.550a* by using a cold neutron spectrometer, CG-4C HFIR. We also measured a field dependence of a magnetic peak and found that the peak disappears above 2 T. 2 T is too small to attribute this change to saturation of the moments to the field direction. In order to investigate the change at 2 T, we performed a neutron diffraction experiment at cold neutron triple axis spectrometer MIRA, in FRM-II. The sample was mounted on a cupper plate, with a (h 0 l) scattering plane and was installed in a helium 3 insert and both of horizontal and vertical magnetic fields. Then magnetic field and temperature dependences of magnetic Bragg peaks were measured. Fig. 1 shows field dependence of a (0.56 0 0) peak in a field increasing process. There appears a difference between intensities with horizontal and vertical fields. The detailed analysis of the magnetic structure is still in undergoing.

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References?

[1] H. S. Greenside, et. al., PRL 46 (1981) 49.
[2] M. Tachiki, et. al., Solid State Commun. 31 (1979) 927.

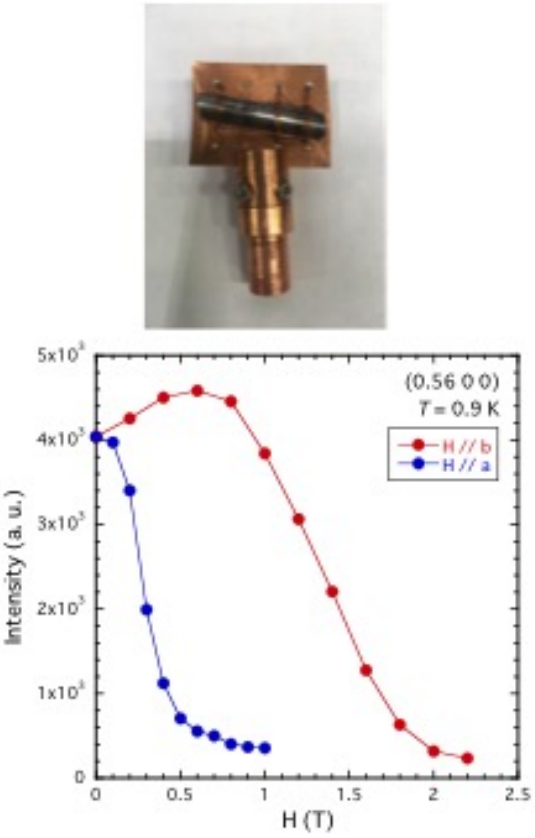

Fig. 1. A single crystal of Tb0.47Y0.53Ni2B2C and magnetic field dependence of (0.56 0 0) peak.