

Magnetic structure and crystalline-electric-field splitting in the tetragonal rare-earth compound CeB_2C_2

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The rare-earth borocarbide CeB_2C_2 exhibits long-range magnetic order at $T_N = 7.3$ K where incommensurately modulated structure with the modulation vector $q_M = (0.161, 0.161, 0.100)$ is stabilized [1]. Magnitude of the ordered moment was inferred to be very small. With applied magnetic field of about 1 T in the basal plane, CeB_2C_2 is known to exhibit metamagnetic behavior, recovering the magnetic moment of more than $0.9 \mu_B$ [2]. In order to elucidate the magnetic structure of the ordered incommensurate phase, and to gain insight into the origin of metamagnetic transition, we have performed both the neutron elastic and inelastic scattering experiments.

Single crystals of $\text{Ce}^{11}\text{B}_2\text{C}_2$ were grown by the floating zone method. A single crystal was mounted in a liquid-He cryostat with a superconducting magnet and cooled down to $T = 2.0$ K (below T_N).

First, we observed field dependence of the Bragg intensities. The magnetic field was applied along the $[1\bar{1}0]$ direction. Shown in Fig. 1(a) is the field dependence of the integrated intensity observed at the incommensurate peak position $Q = (\delta, \delta, 1 - \delta')$ with $\delta = 0.166$ and $\delta' = 0.110$. Also shown as Fig. 1(b) is the field dependence at $Q = (2, 2, 1)$. In both the figures, an abrupt change was observed at $H = 0.9$ T. Since the incommensurate peak intensity decreases whereas the intensity at the lattice peak position $Q = (2, 2, 1)$ increases, we may conclude that the metamagnetic transition observed in the $M - H$ curve is due to the abrupt change of the magnetic structure from the low-field incommensurate phase to the field-induced ferromagnetic/ferrimagnetic structure. Detailed magnetic structure

analysis is now in progress.

[1] K. Ohoyama *et al.*, J. Phys. Soc. Jpn. **72** (2003) 3303.

[2] H. Onodera *et al.*, J. Magn. Magn. Mater. **221** (2000) 293.

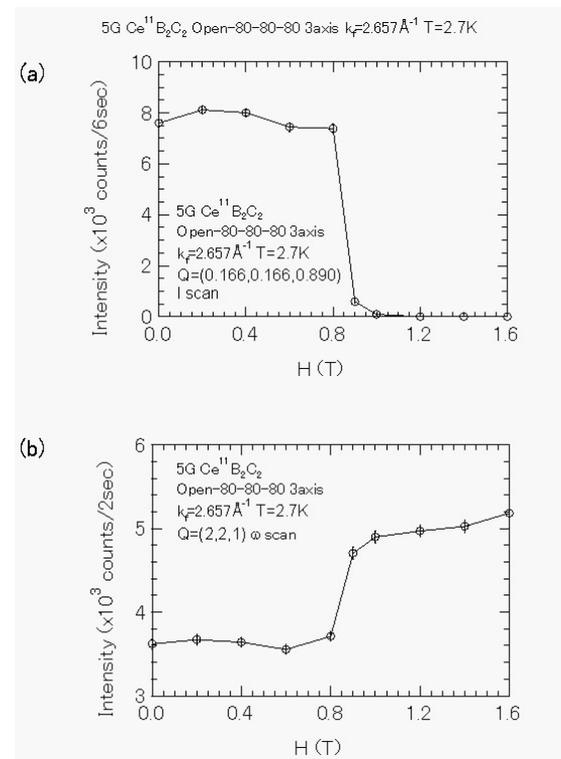


Fig. 1. Field dependence of the integrated intensity measured at (a) $Q = (\delta, \delta, 1 - \delta')$ and (b) $Q = (2, 2, 1)$.