

## Magnetic excitations of high T<sub>Q</sub> compound YbAl<sub>3</sub>C<sub>3</sub>

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YbAl<sub>3</sub>C<sub>3</sub> shows a second-order transition at 80 K on the result of specific heat measurement. We think that this transition indicates an antiferroquadrupolar ordering (AFQ) and we are interested in the reason of extremely high transition temperature. It is important to determine crystalline electric fields (CEF) parameters to discuss detail of the AFQ. Therefore, we carried out inelastic neutron scattering experiments of YbAl<sub>3</sub>C<sub>3</sub>.

Fig.1(a) shows inelastic neutron spectra of YbAl<sub>3</sub>C<sub>3</sub> and LuAl<sub>3</sub>C<sub>3</sub> at 8 K and 100 K. The well-defined excitations are observed around 14, 20, 33 and 43 meV. The spectra of LuAl<sub>3</sub>C<sub>3</sub> shows phonon contributions around 14 and 43 meV. However, the intensity of the peak around 43 meV of YbAl<sub>3</sub>C<sub>3</sub> decreases obviously with increasing temperature. Therefore, this excitation is attributed to magnetic one. As a result, it is thought that the split of the CEF are 20, 33 and 43 meV.

On the other hand, unexpected magnetic excitations were observed around 1.5 and 2.9 meV in Fig.1(b). It seems that these excitations appear below 80 K. A decrease in temperature splits the excitations into two peaks and the intensities develop dramatically. At this stage, we do not have an understanding of the mechanism that allows such a giant magnetic excitations to form. However, a valence of Yb ion is estimated to be a trivalent state with large antiferromagnetic interaction between Yb ions by magnetic measurements (effective Bohr magneton 4.57, Weiss temperature -94 K). Furthermore, Yb ions form a triangular lattice and no magnetic transition was observed down to 20 mK. We think that such the behavior of low energy excitations suggests a sign of a frustration or a fluctuation between Yb magnetic moments.

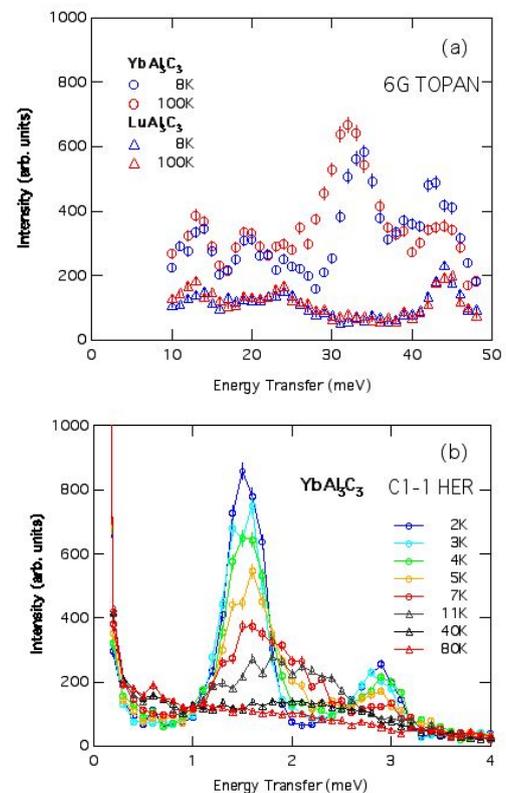


Fig. 1. Inelastic neutron spectra of YbAl<sub>3</sub>C<sub>3</sub> and LuAl<sub>3</sub>C<sub>3</sub>.