# Inelastic neutron scattering study on 1/1 approximant Ag-In-Tb

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Quasicrystals are characterized by sharp Bragg reflections with a point symmetry which is forbidden in a periodic lattice, such as the five-fold symmetry. Quasicrystal can include magnetic ions, called as "magnetic quasicrystals". These magnetic quasicrystals provide us an intriguing playground to experimentally investigate the magnetic ordering and dynamics in the quasiperiodic spin systems.

Macroscopically, the magnetic quasicrystals mostly show the spin-glass-type freezing at low temperatures, as seen in the Zn-Mg-RE (RE: rare-earth) quasicrystals. Nevertheless, the spin dynamics, observed by neutron scattering, is very different from canonical spin-glasses; in several magnetic quasicrystals, highly localized inelastic mode was observed as broad inelastic peak [1]. The origin of the inelastic mode is inferred to be spin-wave-like modes localized in the dodecahedoral spin clusters, which are characteristic clusters in the icosahedral quasicrystals. To confirm this idea, we have performed neutron inelastic scattering study in the Ag-In-Tb 1/1 approximant, which is made of icosahedral clusters arranging periodically.

Polycrystalline samples of the $Ag_{47}In_{39}Tb_{14}$ 1/1 approximant were prepared in usual manner. The powdered sample was loaded in the closed cycle $^4$He refrigerator, and the inelastic spectrum was observed using the ISSP-GPTAS and ISSP-HER triple-axis spectrometers installed at the JRR-3 research reactor.

Figure 1 shows the inelastic spectra at several temperature in the range of $3.5 < T < 150$ K. In the high temperature range, only the quasielastic response may be seen in the spectrum, whereas as the temperature is decreased, evolution of the low energy peak around 4 meV is evident. We note that this behavior is almost the same as those observed in the Zn-Mg-Tb quasicrystal (except for the characteristic energy scale), and thus conclude that the inelastic mode is due to the local high-symmetry clusters commonly found in the quasicrystalline and crystalline phases.

[1] T. J. Sato *et al.*, Phys. Rev. B 73 (2006) 054417.

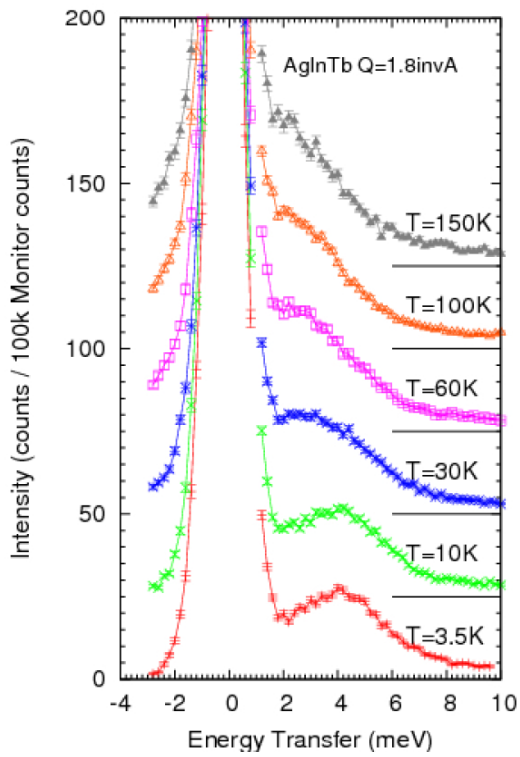


Fig. 1. Inelastic scattering spectrum of Ag-In-Tb. A broad peak at 4 meV appears below 60 K.