

High-energy excitations in BaFe₂As₂

K. Matan and T. J. Sato

ISSP, University of Tokyo and TRIP, JST

In 2008, a group in Japan reported high-*T_c* superconductivity in the Fe-based layered material LaFeFAsO [1]. Since then, a boom of the superconductivity research has been continuing all over the world to date. An intriguing system of this class may be BaFe₂As₂, since it becomes superconducting in various ways, such as chemical doping or applying pressure. In 2009, we performed inelastic neutron scattering experiments for the first time on the single crystalline BaFe₂As₂, and showed that there is a gapped spin-wave-like excitation in the low energy regions ($\hbar\omega < 40$ meV) in this system [2]. To extend the energy range, we have performed neutron inelastic scattering study of BaFe₂As₂ at the PONTA spectrometer.

Shown in Fig. 1 is the typical inelastic scattering spectrum obtained at PONTA using the single crystal of Ba(Fe,Co)₂As₂ (approximately 1 gram). As can be seen in the figure, a strong background hinders the gapped behavior. The spectrum was also checked using exactly the same parent sample BaFe₂As₂ used in the GPTAS experiment, but the background level was unacceptable to observe small signal from the BaFe₂As₂ and/or Ba(Fe,Co)₂As₂ single crystals. We have tried various ways to reduce the background, and at the end we have succeeded in reducing the background by roughly a factor of 2. However, this was not sufficient for our purpose, i.e., observation of the higher energy excitations, which is definitely weaker, and thus we have terminated this project at PONTA, and decided to continue at either spallation source or overseas facilities where Cu monochromator is available.

[1] Y. Kamihara et al., *J. Am. Chem. Soc.* 130 (2008) 3296.

[2] K. Matan et al., *Phys. Rev. B* 79 (2009) 054526.

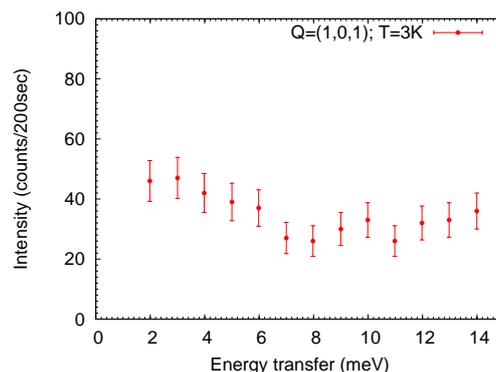


Fig. 1. Inelastic spectrum at $Q=(1,0,1)$ and at $T=3K$ for the Ba(Fe,Co)₂As₂.