高分解能X線非弾性散乱による BaVS3 のフォノン分散

田中良和、理化学研究所、播磨研究所

Charge density wave (CDW) states in quasi-one-dimensional systems have been studied for over 25 years. Among these, $BaVS_3$ is particularly attractive. It undergoes three phase transitions below room temperature (T_S=240 K, T_{MI}=70 K, T_X=30 K). At T_{MI}, it undergoes a very intriguing metal-to-insulator transition that has raised a lot of interest. The magnetic susceptibility exhibits a sharp maximum at T_{MI}, however, no long range magnetic order has been observed. It has been found that a structural phase transition develops at T_{MI} [1], and one-dimensional lattice fluctuations originating at a CDW instability have been detected in x-ray diffuse scattering studies [2]. However the detailed lattice dynamics is unknown. We have measured several phonon spectra of $BaVS_3$ at the beamline BL35XU. The experiment has been carried out at several temperatures and several q positions. Figure 1 shows the phonon spectra measured at T=50, 70, 80, 100, 230, and 300 K at q=(0, 0, 6.5). The temperature factor is corrected. We have observed that the phonon mode at E=5.76 meV is suppressed as decreasing temperature to 70 K (T_{MI}). This is an evidence of softening of the phonon mode, which is possibly related to the MI transition. This work has been done in collaboration with J. Sutter, A. Baron, S. Tsutsui, H. Nakamura.

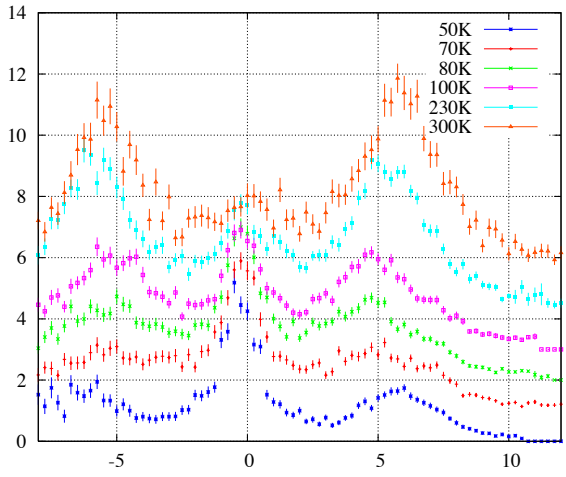

Figure 1 The spectra measured at q=(0, 0, 6.5) and at T=50, 70, 80, 100, 230, and 300 K.

[1] T. Inami et al. PRB **66**, 073108 (2002).
[2] S. Fagot et al., PRL **90**, 196401 (2003).