

Inelastic x-ray scattering of $\text{SmOs}_4\text{Sb}_{12}$ S. Tsutsui¹, J. P. Sutter¹, A. Q. R. Baron^{1,2}, D. Kikuchi³, H. Sugawara⁴, and H. Sato³¹Japan Synchrotron Radiation Research Institute, SPring-8, Sayo, Hyogo 679-5198²RIKEN, SPring-8, Sayo, Hyogo 679-5148³Graduate School of Science, Tokyo Metropolitan University, Hachioji, 192-0397⁴Faculty of Integrated Arts and Sciences, Tokushima University, Tokushima 770-8502

$\text{SmOs}_4\text{Sb}_{12}$ is an unconventional heavy fermion system, which is insensitive to the applied magnetic field [1]. The origin of the unconventional heavy fermion behavior has been discussed. However, this has not been clarified yet. The strongly correlated electron system coupled with Einstein modes was already discussed in theories [2, 3]. In order to investigate the electron-phonon coupling correlated with attractive physical properties in $\text{SmOs}_4\text{Sb}_{12}$, we have carried out inelastic x-ray scattering.

The experiment was carried out at BL35XU in SPring-8 [4]. The energy resolution is about 1.5 meV obtained by the Si(11 11 11) backscattering monochromator. We have investigated the phonon dispersion at room temperature and temperature dependence of the inelastic x-ray scattering spectra at some q-positions.

The dispersion obtained at room temperature demonstrates that the low-lying dispersionless modes exist in every high symmetric direction of $\text{SmOs}_4\text{Sb}_{12}$. The comparison with the recent ab initio calculation suggests that this low-lying modes comes from Einstein-like localized modes of Sm atoms [5]. In addition, the energy obtained by inelastic x-ray scattering agrees with the recent results of the Raman scattering [6].

A significant temperature dependence are observed in the localized modes. The temperature region where the spectra are changed agrees with that where the valence of Sm ions is changed [7]. This suggests that the localized modes are strongly coupled with the electronic states. The correlation between the presence of the Einstein-like localized modes and unconventional heavy fermion behavior in $\text{SmOs}_4\text{Sb}_{12}$ has not been clarified yet up to now.

ST thanks Profs. M. Udagawa and N. Ogita, and Drs. T. Hasegawa, M. Mizumaki and M. Tsubota for fruitful discussion.

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