Inelastic X-ray and Neutron Scattering of High-Entropy Alloys

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Much attention has been paid to excellent mechanical properties of a series of high-entropy alloys as promising structural materials for recent decades [1, 2]. The entropy in the name of alloys is derived from configuration entropy. In these alloy systems, one crystarographic site are shared with several atoms. The concept of high-entropy alloy has also been applied to exploring novel fucntional materials such as superconducting compounds, catalysts, and so on.

Phonon dispersion relations are helpful to understand origin of mechanical properties in materials on microscopic viewpoints. However, analyses of dynamical structure factors have not been established in high-entropy alloys theoretically and experimentally. Nowadays, we have two techniques, inelastic X-ray and neutron scattering, to elucidate dynamical structure factors in materials, connected with phonon dispersion relations. Since scattering cross section of phonons differs between X-rays and neutrons, comparison of dynamical structure factors obtained by inelastic X-ray and neutron scattering enables us to understand element-specific roles in the excellent mechanical properties in high-entropy alloys microscopically.

In this talk, correlations between mechanical properties and phonon dispersion relations will be discussed through dynamical structure factors obtained by inelastic X-ray and neutron scattering techniques.

[1] J.-W. Yeh, *et al*., Adv. Eng. Mat. **5**, 6 (2004).

[2] B Cantor *et al*., Mat. Sci. Eng. **A375-377**, 213 (2004).