Correlation between defects and phonon-dispersion in organic-inorganic hybrid perovskite materials: Toward THz-based applications

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Organic-inorganic hybrid perovskite (OHP) materials with universal physical properties, such as controllable bandgaps, weak exciton binding energies, and high-carrier mobilities with long lifetimes, are reviewed in terms of one of the challenges for several key applications including solar cells, optoelectronics, diodes, memory devices, and detectors. Currently, the terahertz (THz) detector, one of the possible applications, has been a focus of attention because of its potential use in medical devices. The THz energy range is strongly correlated with molecules and biomaterials. In fact, OHP materials possess both molecular vibrations from the organic component and lattice vibrations from the inorganic component. Previous studies have shown that THz absorption depends not only on the elements comprising the perovskite but also on the corresponding fabrication methods. Additionally, these materials have major advantages, including their low unit cost in comparison with that of highly purified III–V or II-VI compound semiconductor materials. To realize THz-based applications using OHP materials, an in-depth understanding of phonon modes in the range of 0.5–3 THz is required.

This seminar will focus on the correlation between defects and phonon-dispersion on OHP materials to find a possibility for THz-based application.