Raman studies on structural phase transition in few-layer 1T’ MoTe₂

Molybdenum ditelluride (MoTe₂) is one of the transition metal dichalcogenides (TMDs) and crystallizes in several polytypes. At room temperature, both semiconducting 2H and metallic 1T’ phases of bulk MoTe₂ are stable, which enables various applications in electronic devices [1, 2]. Also, temperature-driven structural phase transition from monoclinic 1T’ to orthorhombic Td phase accompanied by inversion symmetry breaking has been reported [3]. Since the Td phase of MoTe₂ is known as a candidate of type-II Weyl semimetal which hosts exotic topological properties [4], comprehensive understanding of the transition is of importance. The transition can be thoroughly investigated by using Raman spectroscopy which is sensitive to the symmetry of sample [5]. Since inversion symmetry is also dependent on the number of layers [3, 6], determination of the thickness dependence of the Raman spectrum is crucial.

We prepared few-layer MoTe₂ samples by mechanical exfoliation from 1T’ MoTe₂ single crystal and performed polarized Raman measurements for different thickness, from monolayer to bulk. Also, we measured temperature-dependent Raman spectra and determined the transition temperature for each thickness.

References