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Raman studies on structural phase transition in few-layer 1T′ $MoTe_2$

Molybdenum ditelluride ($MoTe_2$) 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 $MoTe_2$ are stable, which enables various applications in electronic devices [1, 2]. Also, temperature-driven structural phase transition from monoclinic 1T′ to orthorhombic T_d phase accompanied by inversion symmetry breaking has been reported [3]. Since the T_d phase of $MoTe_2$ 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 $MoTe_2$ samples by mechanical exfoliation from 1T′ $MoTe_2$ 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

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