

Mode-selective Raman Signal Enhancement in MoS₂/WS₂ Heterostructures

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In the family of van der Waals materials, transition metal dichalcogenides (TMDCs) have attracted much attention in recent years. Stacking various TMDC materials forms heterostructures in which new phenomena, such as interlayer charge transfer and interlayer excitons [1] occur. However, for the observation of interlayer effects good contact between the constituent monolayers is crucial.

Here, we investigate bilayer heterostructures that were formed by combining Chemical Vapor Deposition (CVD) grown MoS₂ and exfoliated WS₂ monolayers. Photoluminescence quenching is used as an indicator to evaluate the interlayer coupling. In addition, the out-of-plane (A_{1g}) phonon mode provides information on the interfacial contact [2]. We observe a selective enhancement of the WS₂ A_{1g} Raman mode in well-coupled MoS₂/WS₂ heterostructures compared to WS₂ monolayers or heterostructures with only poor contact. A systematic study of this phenomenon is presented to elucidate its microscopic origin.

References

- [1] Fang et al., Proc. Natl. Acad. Sci. USA, 111 (2014) 6198
- [2] Zhou et al., ACS Nano, 8 (2014) 9914