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# Janus Monolayer-Induced Abnormal Interlayer Coupling in 2D Heterostructures

Janus transition metal dicalcogenide (TMD) is a newborn of the two-dimensional (2D) materials family. Its structure is similar to TMDs such as $MoS_2$, but one layer of chalcogen is different from the other layer, one example being MoSSe. Due to the unique crystal structure of Janus TMD, unconventional phenomena have been theoretically predicted, including out-of-plane piezoelectricity and exciton disassociation by the intrinsic out-of-plane dipole moment. In this talk, I will introduce our recent work on the fundamental phonon properties of Janus monolayer MoSSe and interlayer coupling of MoSSe/$MoS_2$ heterostructures. Interlayer breathing and shear modes of high-symmetry 2H and 3R heterostackings are probed by low frequency Raman spectroscopy. Unintuitively, interlayer coupling strength in the heterostructures is stronger than their pure $MoS_2$ counterparts possibly due to the compressive (tensile) strain in MoSSe ($MoS_2$) introduced during synthesis. Difference in high frequency modes between MoSSe/$MoS_2$ and pure $MoS_2$ supports the strain hypothesis. These spectroscopic features can serve as a fingerprint of stacking configurations, interlayer coupling in heterostructures, and degree of selenization in the fabrication process from TMDs to Janus TMDs.

## References

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