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## Optical study of WS<sub>2</sub>/ReS<sub>2</sub> heterostructure

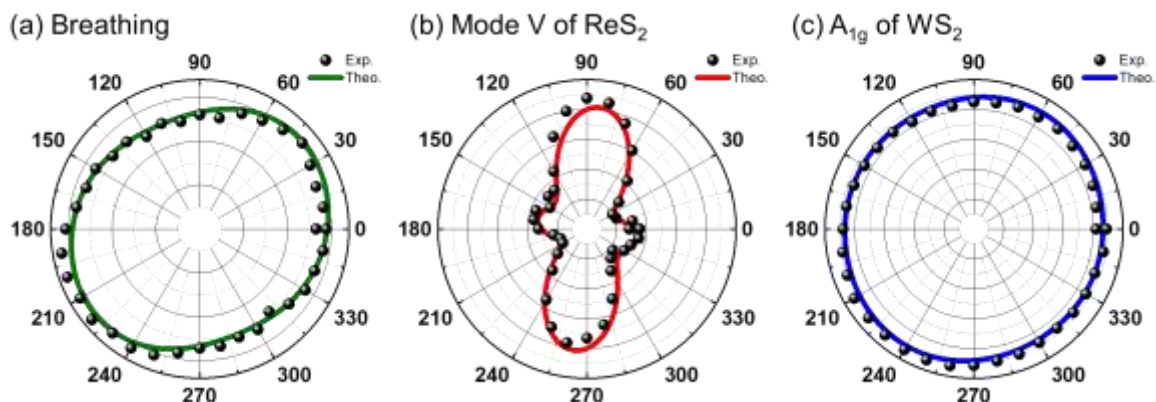
The heterostructures of transition-metal dichalcogenides (TMDs) are attracting much interest owing to the possibility of modulating the physical properties by varying the combinations. Tungsten disulfide (WS<sub>2</sub>) and Rhenium disulfide (ReS<sub>2</sub>) are widely studied materials. WS<sub>2</sub> has a hexagonal isotropic structure whereas ReS<sub>2</sub> has a distorted 1T structure with strong anisotropic properties. Although those materials are intensely studied, the heterostructure of the two materials has not been studied yet. We studied the heterostructure of WS<sub>2</sub> and ReS<sub>2</sub>, which is a combination of isotropic and anisotropic materials.

We prepared WS<sub>2</sub>/ReS<sub>2</sub> heterostructure samples by stacking two monolayers of WS<sub>2</sub> and ReS<sub>2</sub> using the dry-transfer technique [3]. The interface quality of the heterostructure was inspected with low-frequency Raman measurement because the low-frequency signal is sensitive to the interlayer coupling. The Raman spectrum measured from the monolayer region and heterostructure region are compared and analyzed with respect to the polarization directions of the incident light. We found that the layer-breathing-mode (LBM) appeared in some samples and shows a weak anisotropy.

### References

- [1] C. Jin et al., Science 360(6391) (2018) pp.893-896.
- [2] A. K. Geim et al., Nature 499 (2013) pp.419-425.
- [3] A. Castellanos-Gomez et al., 2D Mater. 1 (2014) p.011002.

### Figures



**Figure 1:** Polarization dependence of Raman modes of (a) Breathing mode (b) Mode V of ReS<sub>2</sub> (c) A<sub>1g</sub> mode of WS<sub>2</sub>