

## Supplementary Information

# Comparison of Frictional Properties of CVD-Grown MoS<sub>2</sub> and Graphene Films under Dry Sliding Conditions

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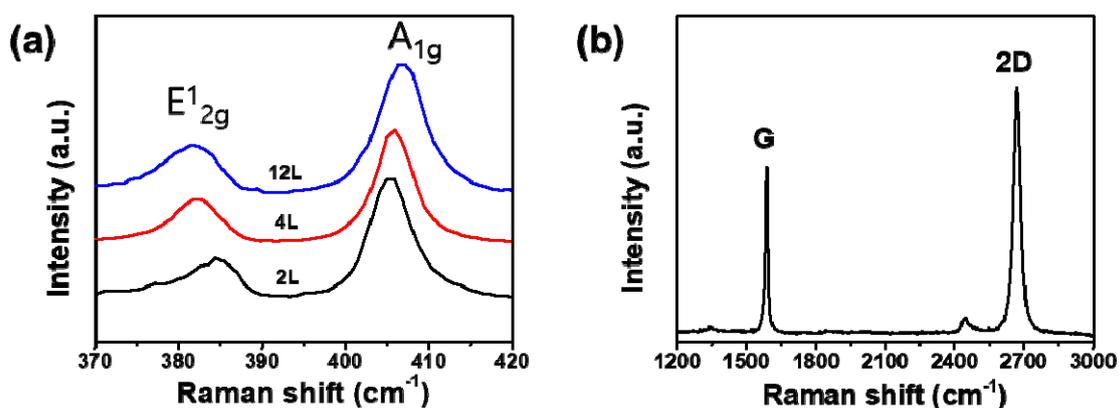
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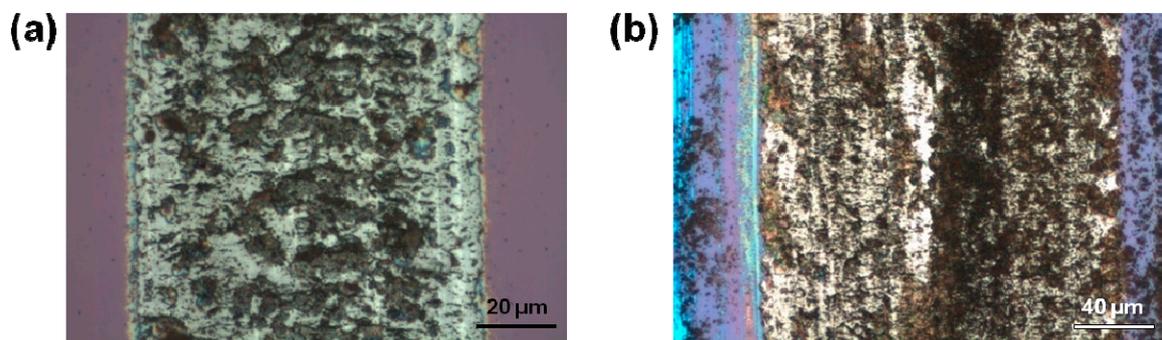
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**Figure S1.** Raman spectra of (a) MoS<sub>2</sub> and (b) graphene samples. The thickness of prepared MoS<sub>2</sub> samples corresponds to 2L, 4L, and 12L thickness. Graphene corresponds to 1L thickness.

Depending on the number of MoS<sub>2</sub> layer, E<sub>12g</sub> and A<sub>1g</sub> Raman mode changes. With increasing the number of layer, the frequency of E<sub>12g</sub> exhibits redshifts, while that of A<sub>1g</sub> shows blueshifts. Therefore, the number of layer (or the thickness) can be determined. C. Lee et al. (Anomalous Lattice Vibrations of Single- and Few-Layer MoS<sub>2</sub>, ACS Nano Vol. 4, pp 2695–2700, 2010) proposed the Raman frequencies as an indicator of the layer thickness and this method have been widely used. The frequency differences (cm<sup>-1</sup>) between these two Raman modes in Supplementary Figure S1 (2L(20), 4L(24), 12L(25)) are very close to the reference data. Also, similar results can be found in another Reference (Y. Lee et. al. Synthesis of Wafer-Scale Uniform Molybdenum Disulfide Films

with Control Over the Layer Number Using a Gas Phase Sulfur Precursor, *Nanoscale* 2014, 6, 2821–2826.).



**Figure S2.** Optical images taken from the bare SiO<sub>2</sub> and 1L graphene samples after 20 sliding cycles on macro-scale. After 20 sliding cycles, sever wear damages were observed on 1L graphene samples. This indicates that the tested 1L graphene cannot protect sliding surfaces.