Manipulating Stacking Order in MoS2 through Van der Waals Force Techniques

Wang Tingyu
Colin Robert Woods
Institute for Functional Intelligent Materrials, National University of Singapore, 117542, Singapore
Contact at E0554189@u.nus.edu

In the realm of materials science, the study of MoS2 and its stacking configurations—ABC and ABA—presents an intriguing opportunity to tailor material properties for diverse technological applications. ABC-stacked MoS2 is celebrated for its semiconductor attributes and stability, while the less common ABA stacking offers distinct structural and electronic characteristics, influencing the material's suitability for various uses. Leveraging insights from the manipulation of stacking orders in graphene through Van der Waals forces[1], our project explores the visualization and control of MoS2 stacking sequences using Kelvin Probe Force Microscopy (KPFM).
Our research focuses on using KPFM for precise mapping of surface potential variations, differentiating between ABC and ABA stacking configurations in layered materials. We introduce a novel method for manipulating these stackings by introducing shear forces through PDMS and PMMA stamps.
By demonstrating the ability to control stacking sequences, our work contributes to the broader field of nanotechnology, enabling the development of innovative devices with tailored electronic and mechanical characteristics.

References

[1] Yaping Yang, Yi-Chao Zou, Colin R. Woods, Yanmeng Shi, Jun Yin, Shuigang Xu, Servet Ozdemir, Takashi Taniguchi, Kenji Watanabe, Andre K. Geim, Kostya S. Novoselov, Sarah J. Haigh, and Artem Mishchenko, *Nano Letters* **2019** 19 (12), 8526-8532

Figures

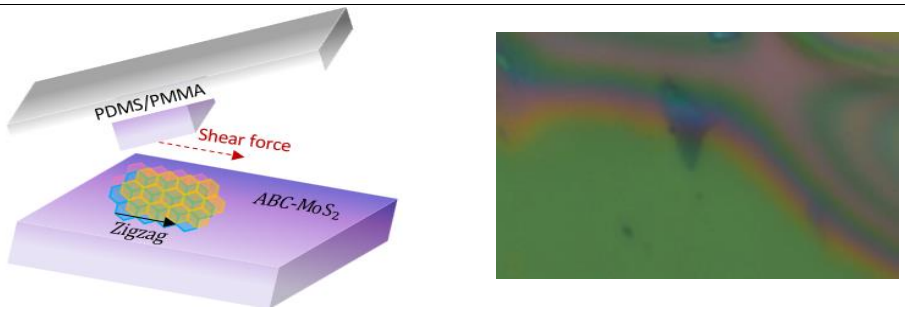

Figure 1: Schematic and optical images of the shear force applied to the flakes during micromechanical transfer.

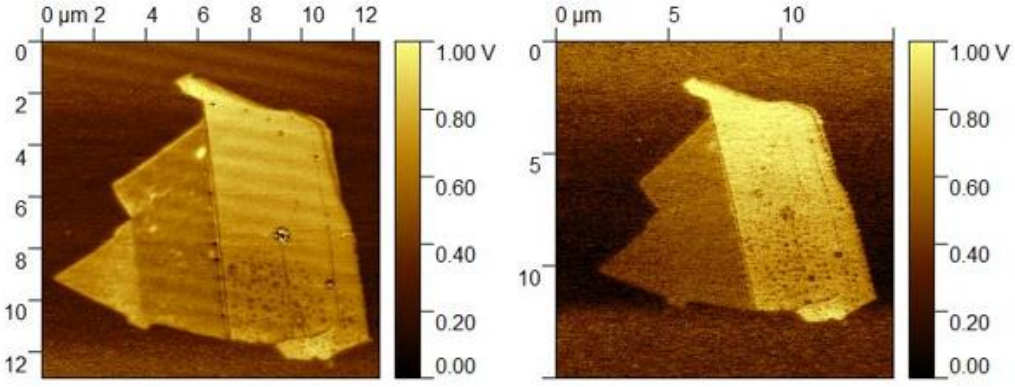

Figure 2: KPFM maps before and after the sliding via Van der Waals Force techniques.