Tip-Enhanced Raman Spectroscopy (TERS) of Transition Metal Dichalcogenides

Pooneh Farhat
François Lagugné-Labarthet
Tsun-Kong Sham
Zhiqiang Wang
Chemistry Department, Western University, 1151 Richmond Street, London, N6A 5B7 Canada
pfarhat@uwo.ca

Abstract

Two-dimensional (2D) layered materials have been particularly attractive due to their unique structure and excellent optical, thermal, mechanical and electrical properties.[1] In particular, 2D transition metal dichalcogenides (TMDs), such as $MoSe_2$ and MoS_2, show unique physical and chemical properties when the thickness is limited to a few layers. TMDs have been widely considered for different applications such as in energy storage, electronic devices, optoelectronic and biosensing.[2]

In this work, MoS_2 flakes are prepared by chemical vapor deposition (CVD) method and the resulting flakes display a variety of shapes and thicknesses. Tip-Enhanced Raman spectroscopy is used to study the lattice vibrations of individual flakes and reveal the presence of defects and the influence of the flake thickness. Specifically, the mapping of the A_{1g} and E_{2g} Raman modes are investigated and the contrast between the far-field and near-field signal was measured. Additionally, the mapping of the surface potential of few layers MoS_2 is collected and correlated with the TERS images

REFERENCES

[1] Tan, Shu Min, and Martin Pumera, ACS Nano 13, 3 (**2019**): 2681-2728.
[2] Tongay, Sefaattin, Jian Zhou, Can Ataca, Kelvin Lo, Tyler S. Matthews, Jingbo Li, Jeffrey C. Grossman, and Junqiao Wu, Nano Letters 12, no. 11 (**2012**): 5576-5580.

FIGURES

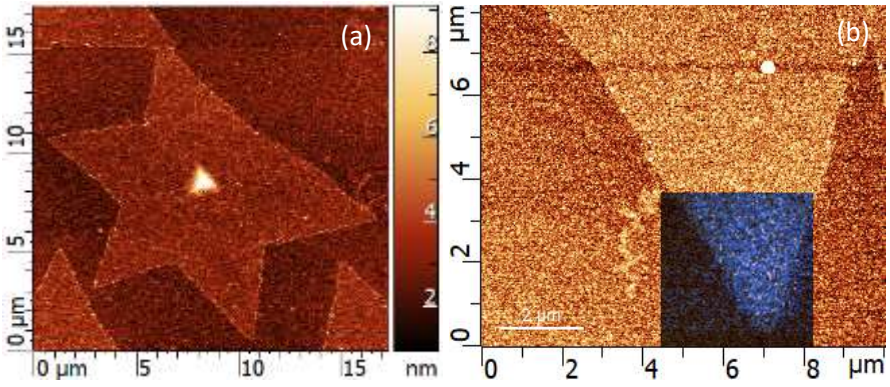

Figure 1: (a) Atomic Force Microscopy (AFM) image of monolayer MoS_2 on SiO_2/Si substrate. (b) AFM image of monolayer MoS_2 on SiO_2/Si substrate and an overlaid TERS map.