Thermal characterization of MoS_2 mono/few layers using Scanning Thermal Microscopy (SThM)

M. Frausto-Avila[1,2]
V. Arellano-Arreola[2], M. Yañez-Limon[2], A. De Luna-Bugallo[2], S. Gomès[1], P.-O. Chapuis[1].
[1]*CETHIL UMR5008, Univ Lyon, CNRS, INSA-Lyon, Université Claude Bernard Lyon 1, F-69621, Villeurbanne, France*
[2]*CONACYT—Cinvestav Unidad Querétaro, Querétaro, Qro. 76230, Mexico*
cfrausto@cinvestav.com

Scanning Thermal Microscopy (SThM) is an Atomic Force Microscopy-based technique dedicated to the thermal investigation of micro and nanometric structures such as membranes, grains, films, etc [1]. Our technique employs a self-heated resistive nanoprobe (SThM palladium probe) that is brought into contact with the surface of the sample to be characterized. The scanning probe on sample surface provides simultaneously the topography and thermal contrast images of sample. After calibration of the SThM probe using reference bulk materials, point measurements can be used to estimate the effective thermal conductivity of composite nanomaterials. In this work, we applied this technique to characterize molybdenum disulfide (MoS_2) monolayers grown by Chemical Vapor Deposition (CVD) on Silicon Dioxide SiO_{2_300nm}/Si substrates. As shown in Fig. 1 SThM images present a thermal contrast between the substrate and MoS_2. Based on point measurements performed on different regions and MoS2 monolayers along with a thermal modelling of a multi-layered system we have estimated the thermal conductivity of a atomically thin MoS_2 layer.

References

[1] Gomès, S., Assy, A., & Chapuis, P. O., Physica status solidi - a (2015), 212(3), 477-494.

Figures

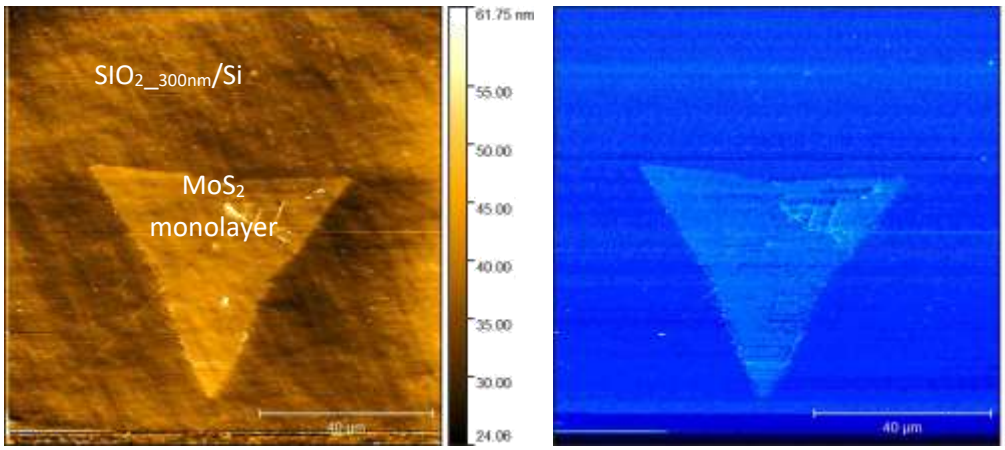

Figure 1: MoS2 monolayers Topography (left) and thermal contrast (right) images obtained by means of SThM with a palladium nanoprobe used in ambient air conditions.