Direct electronic structure determination of flatland materials using a k-space resolved nanoscope

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Remarkable progress has been recently achieved in modern high resolved energy and momentum photoemission setups by focusing down the incident spot light to a nanometric size. This innovative technique named **NanoARPES** (Nano Angle Resolved Photoelectron Spectroscopy) or **k-space nanoscope** is able to determine, with extremely high resolution, the binding energy and momentum of the valence band electrons in atomically ordered mesoscopic solids.

In this lecture, recent NanoARPES results in the field of chemical and electronic imaging of 2D materials will be disclosed, highlighting the basic functioning principles of the k-space nanoscope and the associated instrumentation. More important, the most relevant scientific findings of a few selected 2D materials and their heterostructures will be presented (see Figure 1). In particular, the electronic states associated to remarkable Moiré structures, polaronic coupling, hybridized interlayers in heterostructures, will be reported, [1-5]. Finally, using the electronic and chemical imaging abilities of the k-space nanoscope, the evolution of the electronic band structure of 2D devices in-operando [6] will be presented, see Figure 2.

References

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Figures

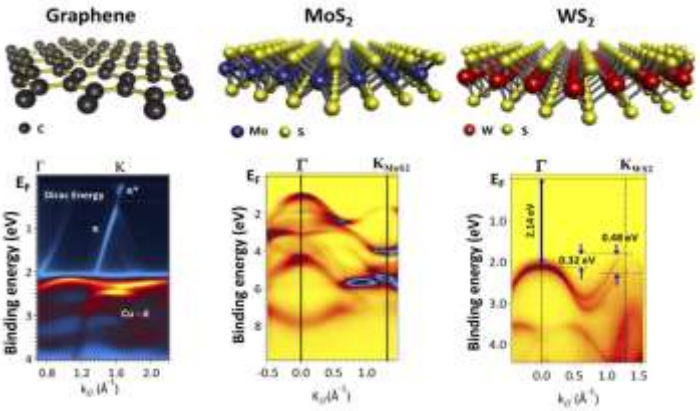

Figure 1: Electronic imaging and punctual NanoARPES plots of graphene films grown on copper foils by CVD (a), monolayer flakes of MoS2 (b) and WS2 (c).

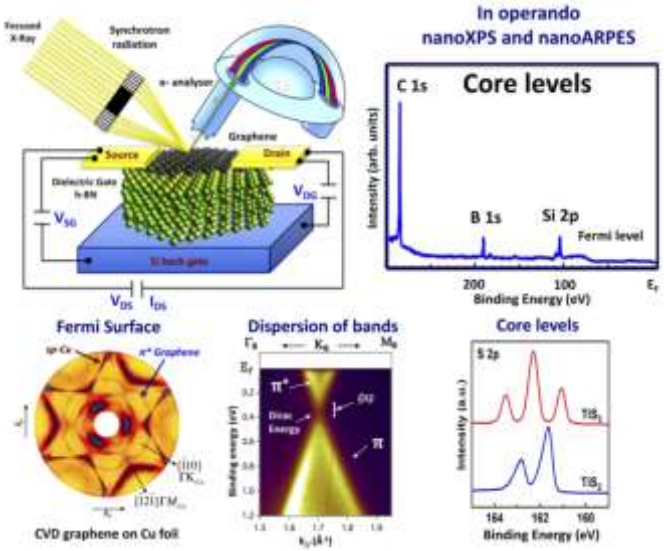

Figure 2: Nano-ARPES and NanoXPS together with an in situ transport characterization using an in-operando setup.