Nano-ARPES facility at ANTARES beamline for Direct electronic structure determination of 2D materials

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In recent decades, we have witnessed exponential advances in a wide diversity of the new nanotechnologies. These advances, seen particularly in nanoelectronics, nanomagnetism and nanochemistry, among others, affect almost every aspect of our lives. Following the fundamental step in the creation of nano-objects and even if these "building blocks" have shown remarkable properties, they would have remained unexploited if, at the same time, we had not developed new tools capable of analyzing, viewing and scrutinizing objects on a wide range of scales, from a few microns to a few tens of nanometers.

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

In this contribution, recent NanoARPES results in the field of chemical and electronic imaging of 2D materials will be disclosed, highlighting the basic functioning principles of the nano-ARPES technic and the associated instrumentation. More important, the most relevant scientific findings of a few selected 2D materials and their heterostructures will be presented.

In particular, the electronic states associated to remarkable Moiré structures, polaronic coupling, hybridized interlayers in heterostructures will be reported, [1-8]. Finally, using the electronic and chemical imaging abilities of this technic, the evolution of the electronic band structure of 2D devices in-operando [9-11].

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