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Cathode lens microscopy of the graphene-metal interface: from nanoscale chemical imaging to micro-ARPES

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The unprecedented scientific interest driven by graphene has recently motivated a large number of experimental studies using cathode lens microscopy. Low energy electron microscopy (LEEM) has been widely employed in these investigations, giving access to the local morphology and crystal structure of few layer graphene on different transition metals (TM) [1]. Energy-filtered photoemission electron microscopes (XPEEM) operating at third generation synchrotron light sources are nowadays able to complement LEEM's structure sensitivity, enabling us to obtain detailed information on the chemical state and electronic structure of both graphene and support while reaching a lateral resolution of only few tens of nm [2]. By implementing laterally resolved versions of the most popular photoelectron spectroscopies, these versatile microscopes offer us a powerful set of analytical surface characterization tools, microprobe angle-resolved photoelectron spectroscopy (-ARPES) and low energy electron diffraction (-LEED) being the most frequently demanded. Importantly, dark-field PEEM imaging methods have been recently demonstrated, paving the way to laterally-resolved measurements of the local density of states in graphene films that are laterally inhomogeneous [3]. The current state and perspectives of XPEEM and related techniques will be illustrated by reporting recent results on graphene on various TMs. In particular, I will highlight the potential of XPEEM in the study of graphene on supports with non-threefold symmetry such as Ir(100) [4,5].

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