High-energy resolution core level photoelectron spectroscopy

Alessandro Baraldi
Department of Physics, University of Trieste

Since the pioneering work by Kai Siegbahn core level spectroscopy has played a key role in elucidating the geometric and electronic structure of solid surfaces. Due to their high localization, core electrons are extremely sensitive to the chemical state and to the local environment (atomic coordination number, bond distances, elemental interaction, etc), and for this reason can be used for the identification of a variety of non-equivalent local configurations. The combination of high-energy resolution now attainable with this technique (better than 50 meV) and the reduced data acquisition time (down to few ms per scan) has opened the possibility to probe physical and chemical properties of a large variety of low-dimensional materials and to shed light on complex processes taking place on solid surfaces and nanomaterials.
Recent experimental results in this field will be discussed in this lecture with the aim of illustrating the breakthroughs achieved in this technique by the employment of x-rays generated by synchrotron light sources. I will show how this approach can be used to study the interaction of atoms and molecules on solid surfaces and much more. The growth mechanism, the interaction with adsorbates, the thermal expansion and stability of epitaxial graphene grown on transition metal surfaces will be discussed as well. Recent results on supported size-selected nanoclusters will emphasize the key role played by core-level spectroscopy in elucidating properties at the sub-nanoscale.