Nanostructures at Atomic Scale: From Energy and Environmental Applications to Quantum Devices

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Technology at the nanoscale has become one of the main challenges in science as new physical effects appear and can be modulated at will. As developments in materials science are pushing to the size limits of physics and chemistry, there is a critical need for understanding the origin of these unique properties and relate them to the changes originated at the atomic scale, e.g.: linked to structural changes of the material, many times related to the presence of crystal defects or crystal surface terminations. Especially on low dimensional materials designed for energy and environmental applications, crystallography and distribution of the atomic species are of outmost importance in order to determine their physical and chemical properties that will improve their performance, including efficiency and selectivity towards certain reactions.

In the present work, I will show how combining advanced electron microscopy imaging with electron spectroscopy, in an aberration corrected STEM will allow us to probe the elemental composition and structure in unprecedented spatial detail, while determining the growth mechanisms and correlating the structural properties to their performance.

In addition, I will show and discuss about the different options around EU that users from Academia and industry can use in order to obtain atomic scale characterization of their materials by means of advanced electron microscopy.