Poster #34

Oxide formation and oxide/metal interaction in Ni(111)

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Metal-oxide interactions are of great importance when studying catalytic materials. In particular, ceria/metal model systems have been studied in many combinations, showing to be excellent systems for studying fundamental properties measured by surface science techniques [1]. The variation of the oxygen chemical potential on the surface of metallic substrates such as Cu(111)[2], Ru(0001)[3] and Au(111)[4] has been shown to significantly affect ceria structures in terms of facet promotion and oxidation states. In the case of Ni, its strong catalytic behavior results in Ni(111) oxidation upon oxygen exposure under the CeO_x deposition conditions; thus, increasing the complexity of the system as multiple interfaces (oxide/metal, oxide/oxide) might be present.

As a preliminary step of the study of the CeO_x on nickel(111) system, we show the structural and spectroscopic effects of exposing the substrate at different oxygen partial pressures and temperatures. We present LEED, XPS and UPS measurements taken in a UHV surface science cluster. At room temperature, the oxygen gets absorbed forming ordered structures, until the formation of NiO(111) layers[5]. For higher temperatures, the formation of NiO(001) islands has been observed[5], although more recent LEEM/PEEM measurements show that the NiO(111) facet can be formed for temperatures up to 750K [6], in accordance with our measurements. By studying the oxygen energy range in XPS, we can differentiate the absorbed oxygen giving rise to the LEED pattern from the more superficial and disordered components.

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