Gold-Ceria based catalysts: the study of a metal/oxide interface's plasticity

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These last few years, growing interest has focused on supported gold-based hybrid nanomaterials caused by their interesting properties in the field of catalysis. One of the major explanations for the synergetic effects between deposited precious metal and oxide supporting nanoparticles lays in the phenomenons occurring at the interfaces where the reactivity of these objects finds its source. A better tuning of the catalytic reactions therefore comes with a better understanding and engineering of these interfaces.

Here, we will focus on the Au/Ce1-xFexO2-x/2 nanostructured system. Morphologically controlled oxide support particles have been synthesized using a solvothermal microwave heating-assisted route, and the gold was deposited following the deposition/precipitation method.

HRTEM analyses have been carried out in order to understand the microstructure of the gold/oxide interface and revealed that designing the shape of the support particle led to a control over the plasticity of this interface. Interactions between gold clusters and electron beam in TEM have been observed, and interestingly, behavior of the gold has been different, depending on the support oxide's morphology. In-situ Raman spectroscopy and XPS characterizations have also been performed on these samples and gave insights into gold species oxidation states and bonding strength with ceria surfaces depending on its chemical composition and crystallography.