第279回触媒化学研究センター談話会

演　題：**Nano-oxides in Catalysis: the “simple” cases of Ceria and Titania**

講演者：Marcos Fernández-García (*Instituto de Catálisi syPetroleoquímica, CSIC*)

日　時：２０１０年　９月１３日（月）　16:00–17:30

会　場：北海道大学創成科学研究棟　４階 セミナー室 A

要　旨：

Metal oxides play an important role in many areas of chemistry, physics, and material science. Oxide materials with technological implications, such as TiO_2 or CeO_2, can be used upon single component configurations or as part of materials containing several components, particularly, as supporting phases. In this talk we will analyze nanostructure effects on mono and multiphasic ceria and titania materials, giving relevance to the establishment of firm structure-activity relationships.

In a general review of the oxides properties, ceria may be considered as a proto-typical material to exemplify to current status of the art. Starting with the influence of the nanostructure on structural properties, we will discuss the intimate interplay occurring between the presence of (mostly punctual) defects and primary particle size, and the consequences on cell parameters/volume and strain. Similarly, consequences (of defects and primary particle size) in electronic properties will be also detailed and a brief list can include the modification of the metal-oxygen bond nature, the discretization of the electronic levels and subsequent band gap alteration, the presence of gap states and, finally, the absence of band bending at interfaces. Considering multiphasic systems and the influence of interface effects on physico-chemical properties we will focus our attention on the analysis of redox properties of alumina-supported ceria nanomaterials.

In a second part of the talk we will discuss the most challenging aspects of the nanostructure effects on physico-chemical properties and will use titania to exemplify first, how to control all morphological (and not only primary particle size) parameters while using modern, appropriate preparation methods, and second, the influence of such morphological properties beyond primary particle size on structural/electronic properties and then on the final, catalytic properties of nanostructured oxides. We will close this contribution by analyzing the doping of titania by several cations like V, Mo, Nb, and W, and how the doping process is affected in its structural/electronic characteristics by the nanostructure and the subsequent consequences in the photo-catalytic properties of the nanomaterials.

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