# SYNTHESIS AND CHARACTERIZATION OF $CeO_2$ NANOCLUSTERS WITH A VERY NARROW SIZE DISTRIBUTION

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**Abstract:** As one of the most reactive rare-earth metal oxides, ceria ($CeO_2$) has attracted extensive attention recently due to the hope it raises for many technological applications in a wide range of fields. The three-way catalysts (TWC), oxygen sensors, solid fuel cells, UV blockers and superhydrophobic coating are just a few representative examples. Cerium is characterized chemically by having two stable valence states, +3 and +4 [1]. Various studies has shown that decreasing the particle size increase the $Ce^{+3}/Ce^{+4}$ ratio [2,3]. Due to these change on the oxidation states, satisfactory results have been reported in antibacterial [4], antioxidant [5], and biological applications. On the later, ceria can act as radical scavenging and protect the cells against reactive oxygen species (ROS) [6], on *in vitro* and *in vivo* tests ceria appear as a promising therapeutics for neuronal degenerative disorders [5]. To be successfully applied in biology nanoparticles should combine the properties of solids with the mobility of the molecules, besides of being stable and not agglomerate. Hence the value of synthesize small size particles with large surfaces that can interact with biological systems

In this work we presented a novel synthesis processes to obtain ceria ($CeO_2$) with a very narrow size distribution ($2.7 \pm 0.3$ nm) and a controlled shape. The synthesis shows excellent reproducibility and the nanoclusters (NCs) could be easily dispersed in nonpolar solvents (e.g., toluene, hexane, chloroform) and are stable for months. The NCs were characterized with High Resolution Transmission Electron Microscopy (HR-TEM), X-Ray diffraction (XRD), thermogravimetric analysis (TGA), fourier transform infrared spectroscopy (FT-IR), and ultraviolet-visible spectrophotometry (UV-Vis). Also, 3D crystal representation of single particles were made using the VESTA 3 software [7]. The exposed crystallographic planes were identified and a brief discussion of the growth mechanisms was made.

**References:**

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