

Rare-earth zirconates in the form of xerogels, aerogels and powders

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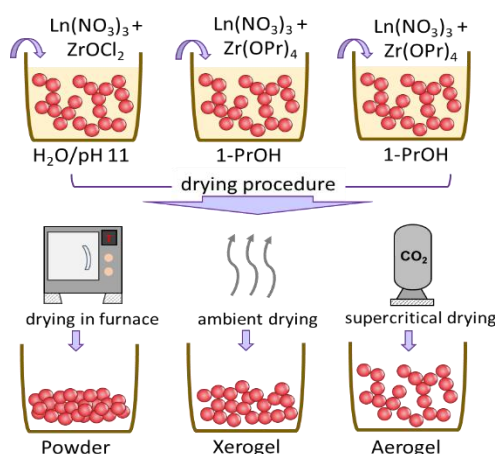
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KEYWORDS: rare-earth zirconates, xerogels, aerogels (Calibri 11, Up to 5 keywords)

ABSTRACT (Calibri 11) (Maximum number of words 300)

This presentation focuses on the the synthesis of four rare-earth zirconate nanomaterials with the general $\text{Ln}_2\text{Zr}_2\text{O}_7$,¹ where $\text{Ln(III)} = \text{La, Nd, Dy, and Gd}$. We isolated these materials in the form of nanopowders, xerogels, and aerogels, enabling a comparative study of their structural characteristics and properties. A comprehensive analysis was conducted using techniques such as X-ray diffraction (XRD), Raman spectroscopy, scanning electron microscopy (SEM), N_2 adsorption–desorption porosimetry, differential scanning calorimetry (DSC), and thermogravimetric analysis (TGA). By compiling all structural data, we showed that, in addition to the chemical composition, the synthetic method and drying protocol have a major impact on the final structural characteristics of the nanostructured materials. Powders were synthesized via co-precipitation, while wet gels were prepared via the sol–gel technique. Ambient drying of wet gels led to xerogels and drying in supercritical CO_2 led to aerogels. Our findings suggest that the synthesized powders consist of nanoparticles arranged in a dense microstructure with a very small specific surface area and porosity. In contrast, xerogels and the aerogels are composed of nanometer-sized globular structures. The xerogels exhibit microporosity, whereas the aerogels demonstrate a wide pore size distribution, highlighting the influence of the drying process on their porous architecture.²



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