

Anodization-Assisted Synthesis of Shape-Controlled Cubic Zirconia Nanotubes

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Abstract : To synthesize a specific phase of zirconia (ZrO_2) nanotubes, zirconium (Zr) foil was subjected to the anodization process in a fluorine-containing electrochemical bath for a fixed duration. The resulting zirconia nanotubes (ZNTs) were then characterized using various techniques, including UV-vis spectroscopy, Fourier-transform infrared spectroscopy (FTIR), transmission electron microscopy (TEM), energy-dispersive X-ray spectroscopy (EDX), and X-ray diffraction (XRD). The XRD diffraction pattern confirmed that the ZNTs were crystalline, with a predominant texture along the [111] direction, indicating that the majority of the phase was cubic. TEM images revealed that most of the nanotubes were vertically aligned and self-organized, with diameters ranging from 32.9 to 38.8 nm and wall thicknesses between 3.0 and 7.3 nm. Additionally, the synthesized ZNTs had a length-to-width ratio of 235, which closely matches the ratio of 240 observed in another study where anodization was not used. This study demonstrates that a specific phase of zirconia nanotube can be successfully synthesized, with promising potential applications in catalysis and other areas.

Keywords : zirconia nanotubes, anodization, characterization, cubic phase

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