Effect of annealing temperature on the structural, morphological and optical properties of ThO2 thin films grown by photochemical metal-organic deposition

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© 2019 In this work, we report the influence of annealing temperature on the structural, morphological and optical properties of ThO2 thin films deposited on fused quartz and (100) silicon substrates by photochemical metal-organic deposition (PMOD) using hinokitiolate thorium (IV) complex as the precursor. X-ray photoelectron spectroscopy (XPS) confirmed the deposition of the ThO2 films. The effect of thermal annealing (from 300 °C to 1100 °C) on the structural properties of the ThO2 films was evaluated with X-ray diffraction (XRD), UV-Vis transmittance spectroscopy, spectroscopic ellipsometry and atomic force microscopy (AFM). XRD patterns of the films annealed above 300 °C revealed that all diffraction peaks belong to a cubic ThO2 structure without preferential orientation. The average crystallite size increased from 2.3 nm to 3.7 nm as the annealing temperature increased from 300 °C to 750 °C. Annealing at 1100 °C promoted the formation of huttonite (β-ThSiO4) in the ThO2 layer. Film