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Effect of samarium addition and annealing on the properties of electrodeposited ceria thin films

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Abstract

Samarium (Sm)-doped ceria (CeO2) (SDC) is a promising material for high temperature electrochemical devices. Our work demonstrates that thin SDC films can be prepared by a cost-effective electrodeposition method at a low-temperature (30°C) and −0.8V/SCE (saturated calomel electrode) potential. Analysis of the structural properties of the obtained SDC films, as-grown and annealed at 600°C, has been carried out by X-ray diffraction (XRD). Morphology and film composition were studied using scanning electronic microscopy and energy dispersive X-ray analysis. Vibrational properties were determined by Raman spectroscopy. The effects of samarium addition into the deposition bath on the final film composition have been studied. According to XRD results, film crystallographic properties are directly linked to the percentage of Sm incorporated in the CeO2 lattice. We report on the electrochemical deposition of the SDC films performed over a large range of Sm additions (0–30%). The effect of temperature annealing has been studied as well.