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Optical properties of Sm-doped ceria nanostructured films grown by electrodeposition at low temperature

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Abstract

Nanostructured undoped and samarium doped ceria thin nanocolumnar films are electrodeposited onto (FTO) glass substrates at low-temperature (30°C) with a subsequent thermal annealing at 600°C for 1h. Films are obtained from mixed Sm3+/Ce3+ aqueous nitrate solutions, applying a −0.8V/(SCE) potential for 1h. Cubic fluorite type ceria nanostructured films of high crystal quality are synthesized as confirmed by X-ray diffraction and Raman spectroscopy. SEM analysis demonstrates that doping with Sm improves the quality of the film with respect to crack formation. The incorporation and activation of the Sm3+ ions in the ceria host as well as the Stark splitting of the manifolds responsible for emission in the red-orange spectral range are investigated by means of photoluminescence spectroscopy.