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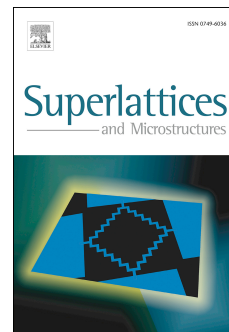
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Effects of transition metal element (Co, Fe, Ni) codoping on structural, optical and magnetic properties of CeO₂:Er nanoparticles

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Abstract:

Cerium oxide nanoparticles monodoped with rare earth Erbium and codoped with rare earth Erbium and transition metal elements (Co, Fe, Ni) were prepared by citrate-nitrate precursor auto combustion method. The structural and surface morphological properties of the nanoparticles were examined by using X-Ray Diffractometer (XRD), Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). The results revealed that all the samples exhibited cubic fluorite structure with irregular flaky shape with some agglomerations. The optical behavior of all the nanoparticles was analyzed by Ultraviolet-Diffuse Reflectance Spectroscopy (UV-DRS). It showed the red shifting of CeO₂ nanoparticles after doped with Er ions and codoped with Er and transition metal ions. The Fourier Transition-Raman Spectroscopy (FT-Raman) studies showed the increased oxygen vacancies concentration in doped and codoped CeO₂ nanoparticles compared to pure CeO₂ nanoparticles. Fourier Transition-Infrared spectroscopy (FTIR) was employed to investigate the structural bond vibrations of the samples. Photoluminescence spectroscopy (PL) technique was used to study the intrinsic defects and oxygen vacancies defects in the host CeO₂ when doped with Er and codoped Er and transition metal ions. The magnetic behavior of the samples was evaluated using vibrating sample magnetometer (VSM). It revealed that all the samples exhibited ferromagnetic nature at room temperature.

Keywords: Cerium Oxide, FT-Raman, Oxygen Vacancies and Room Temperature Ferromagnetism.

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