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8 MeV electron beam induced modifications in the thermal, structural and electrical properties of nanophase CeO₂ for potential electronics applications

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Abstract: The effect of 8 MeV electron beam irradiation on the thermal, structural and electrical properties of CeO₂ nanoparticles synthesized by chemical precipitation route was investigated. The dose dependent effect of electron irradiation was studied using various characterization techniques such as, thermogravimetric and differential thermal analyses, X-ray diffraction, Fourier transformed infrared spectroscopy and impedance spectroscopy. Systematic investigation based on the results of structural studies confirm that electron beam irradiation induces defects and particle size variation on CeO₂ nanoparticles, which in turn results improvements in AC conductivity, dielectric constant and loss tangent. Structural modifications and high value of dielectric constant for CeO₂ nanoparticles due to electron beam irradiation make it as a promising material for the fabrication of gate dielectric in metal oxide semiconductor devices.

Keywords: CeO₂ nanoparticles; electron beam irradiation; structural studies; electrical studies

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