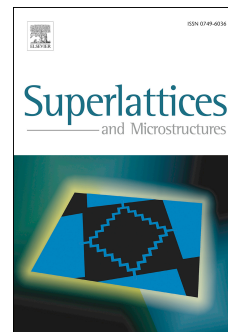


# Accepted Manuscript

Structural, optical and mechanical properties of sol-gel synthesized Mn-doped CeO<sub>2</sub>

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**Structural, optical and mechanical properties of sol-gel synthesized Mn-doped CeO<sub>2</sub>**

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**Abstract:**

CeO<sub>2</sub> has a robust cubic fluorite face centered cubic (f.c.c.) structure. However, substitution in CeO<sub>2</sub> can introduce lattice defects, tune optical properties and generate different functionalities. The oxidation state of a substituent triggers a Ce<sup>4+</sup> → Ce<sup>3+</sup> transformation without destroying the structure but modifies the structure by generating defects. These structural changes should affect physical properties such as mechanical hardness along with electrical, optical and other properties. Mn substitution results in considerable changes in lattice parameters. Optical properties are affected. It is the valence state and ionic radius of the substituent which dominate the structural, vibrational and optoelectronic properties. Analysis reveals contraction of unit cell and increase in lattice strain affecting the hardness of the material. Microhardness studies show Indentation Size Effect with dominant plastic deformation.

**Keywords:** Cerium oxide; Sol-gel; Strain; Urbach energy, micro-hardness.

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