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The effects of annealing temperature on physical properties of $\text{Ce}_2\text{Zr}_2\text{O}_7$ materials

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Pyrochlore oxides are fascinating class of materials known for their remarkable thermal stability and adaptability, making them excellent candidates for energy-related applications. In this study we explore the effects of thermal treatment on structural, morphological, optical, thermodynamic and magnetic properties of $\text{Ce}_2\text{Zr}_2\text{O}_7$ nanoparticles (CZONPs) prepared using sol-gel method and then followed by thermal annealing treatment. The micro-structure, size, optical, and magnetic properties of prepared samples were analyzed using X-ray diffraction (XRD), transmission electron microscopy (TEM), UV-Vis and photoluminescence spectroscopy, and physical properties measurement system (PPMS), respectively. The results showed mixed phases of CeZrO_4 and $\text{Ce}_2\text{Zr}_2\text{O}_7$ at various annealing temperature ranges. The ratio between these phases was changing as a function of annealing temperature. The pure phase of CZONPs was obtained at high temperature. These findings point to a strong correlation between pyrochlore's stability, making the material highly relevant for high-temperature applications.

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