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Sol-gel Synthesis and Characterization studies of Er³⁺ doped TiO₂ nanoparticles

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Abstract content (Max 300 words) Formatting & Special chars

Erbium doped titanium dioxide (TiO₂) nanoparticles were prepared via sol-gel synthesis method. Titanium tetraisopropoxide (TTIP) was dissolved in isopropyl alcohol and water, and the solution formed a gel, which was calcined at 400°C. The X-ray diffraction patterns confirmed the formation of an anatase TiO₂ phase, from which the crystallite sizes were approximated to 7 nm. UV/Vis spectroscopy was used to measure the absorption characteristics of the sample, and the band gap was extrapolated from Tauc's relation. Phonon quantification in TiO₂ was achieved using Fourier Transform Infrared (FT-IR) spectroscopy. A laser beam with 980 nm wavelength was used to irradiate the sample, and the displayed emission lines of TiO₂:Er³⁺ in the visible region of the electromagnetic spectrum confirmed upconversion luminescence.

The mechanism of upconversion process will be discussed, followed by their applications in different areas, especially in solar cells and biological fields for bio-imaging.

Keywords: Sol-gel, TiO₂:Er³⁺, crystallite size, upconversion luminescence, bio-imaging.

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

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