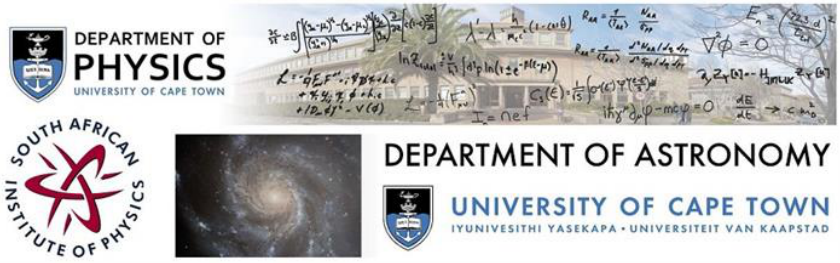

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Structural and optical properties of Holmium doped α-Fe₂O₃ nanoparticles

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Abstract content
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Due to its optical, magnetic, electrical and catalytic properties, iron oxide has attracted attention of researchers from different areas of science. α-Fe₂O₃ is an environmentally friendly n-type semiconductor with the band gap of ˜2.1 eV. It is the most stable iron oxide under ambient conditions. It is widely used in gas sensing, high density magnetic recording media, clinical therapy, Magnetic resonance imaging and diagnosis [1-3]. Rare earth atoms recently have been introduced into the iron oxide matrix which leads to a material that shows multiple interesting effects. Holmium atoms were incorporated into an iron oxide nanoparticle and the concentration of the dopant atom was changed in order to determine its influence on the host crystal.

Un-doped and doped α-Fe₂O₃ particles were successfully synthesized by sol-gel method using PVA as polymerizing agent. The main advantage of PVA is to provide long stability for nanoparticles and by preventing the particles agglomeration. The synthesized powder was separated and annealed at different temperatures. The shape, size, structural and lumenescence studies of the synthesized powder were characterized by XRD, TEM, FT-IR, UV-Vis and PL spectral techniques. A high crystallinity was observed with increasing annealing temperature by XRD. An increase in absorbance and a red shift was observed with increasing annealing temperature. The estimated band gaps of the powders were found to be 5.5 eV and 2.3 eV for powders at 300deg;C and 600deg;C respectively. Un-doped and doped Fe₂O₃ samples were subjected to radiation from the laser beam source to investigate anti-stokes luminescence.

References

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