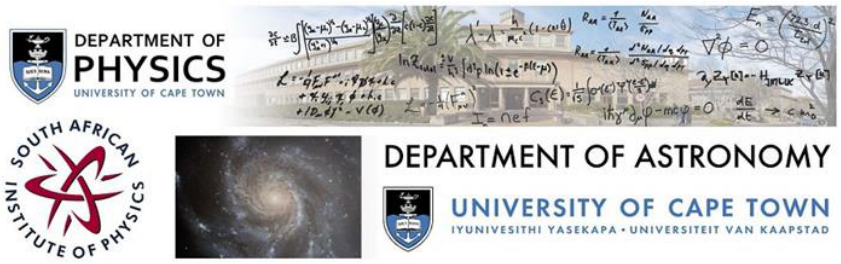

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Effects of precursor concentration on morphological, structure and optical properties of TiO2 synthesised via sol-gel method

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Abstract content
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This study describes the synthesis and characterization of material properties of a nanometric titanium oxide nanopowder. The primary aim of the investigation was to evaluate the effect of tetra-n-butyl-orthotitanate on the stability of TiO2 nanoparticles particularly for the use of wide band gap, high temperature devices such as LEDs and a variety of other sensing devices. XRD patterns of TiO2 powder exhibit anatase phase (JCPD file No. 84-1286). The crystallite sizes estimated using (101) diffraction peaks are found to vary from 16 to 41 nm respectively with an increase of tetra-n-butyl-orthotitanate from 3 to 17ml. SEM images show that at low concentration of tetra-n-butyl-orthotitanate spherical nanoparticles were observed. As the concentrations of precursors increases the nanoparticles become more agglomerated. UV measurements show that samples exhibit absorption peak at 330 nm corresponding to the excitation of electrons from the valence to the conduction band. The synthesized TiO2 nanomaterials has band gap energy between 3.3 and 3.7 with an increase in tetra-n-butyl-orthotitanate which are larger than the value of 3.2 eV for the bulk TiO2 nanomaterials. The PL spectra of TiO2 nano powders revealed a broad intensity band centered at 460 nm with a weak band at higher wavelength (560 nm). These two emissions were assigned to photon incident lines and oxygen defect trap, respectively.

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Primary author: Mr SITHOLE, T M (Vaal University of Technology)

Co-authors: Prof. DEJENE, Francis (University of the Free State); Dr KOAO, L F (University of the Free State)

Presenter: Prof. DEJENE, Francis (University of the Free State)

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