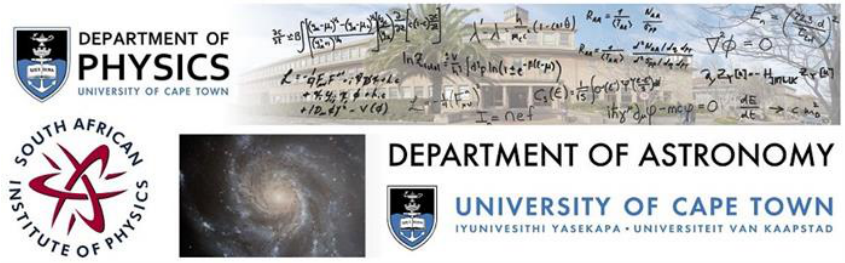

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Down-conversion process in Dy3+, Yb3+ co-doped TiO2 nanophosphor powder

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Abstract content
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A series of TiO2 nanophosphors co-doped with two lanthanide ions (Dy3+, Yb3+) were synthesized by using a sol-gel method at room temperature. The concentration of Dy3+ ions was fixed at 0.5 mol%, while the Yb3+ concentration was varied from 0.05 to 5.0 mol%. The synthesized nanophosphor powders were characterized by X-ray diffraction (XRD), Fourier transform infrared (FT-IR), photoluminescence (PL), ultra-voilet visible spectroscopy (UV-Vis), scanning electron microscopy (SEM) and energy x-ray dispersive spectroscopy (EDS) techniques. The XRD pattern showed the formation of the tetragonal phase of TiO2 with an experimental lattice parameters a = b = 3.803Å and c = 9.534Å. The average crystallite sizes were estimated by using Debye Scherrer equation and were found to range from 9 to 15 nm. The FT-IR results confirmed the existence of different bonds in the prepared nanophosphor powder, in addition the absorption bands which were observed near 450 to 800 cm-1 revealed the vibration properties of the TiO2. The absorption bands of Dy3+ ions were observed in the visible region and also the absorption bands of Yb3+ were observed in the NIR region from the UV-Vis diffuse reflectance spectroscopy. The optical band gap energies of the synthesized nanophosphors were estimated from the Kubelka Munk function and it was clearly observed that the band gap energies decreased as the dopant ions were introduced into the TiO2 lattice. The emission in the NIR coming from the Yb3+ ion was observed by using a 325 nm He-Cd laser PL as the excitation source. The EDS technique confirmed the elements which were found in the synthesized nanophosphor. The particle morphologies of the un-doped and co-doped TiO2 nanophosphor were investigated by using the SEM.

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