



MES AMANI COLLEGE
OF VANDALUR

NCIATRI²³ ABSTRACTS²⁰

Editors

**Ansar E. B., Dhanya P. R., Jisha K. C., Kesavan K.
Lathif Penath, Mohammed Areej E. M. & Sheena P. A.**



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Anatase to Rutile Phase Transformation of TiO₂ Nanoparticles

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The anatase to rutile phase transformation of Titanium dioxide nanoparticles upon calcination is reported here. TiO₂ nanoparticles are synthesized by sol gel method using titanium (IV)-n - butoxide (Ti(OC₄H₉)₄ or Ti(OBu)₄), isopropyl alcohol ((CH₃)₂CHOH) and conc. HNO₃. The thermal stability and the decomposition of synthesized materials are studied using thermogravimetric (TG) analysis. The TGA studies show no weight loss for the sample after 400°C. Hence the as prepared samples are calcined at 400 and 800°C for three hours. The structural characterization of the nanoparticles is done using X-ray diffraction (XRD) technique. The XRD patterns indicate that the structure of TiO₂ is anatase at a calcination temperature of 400°C and rutile at 800°C. The X-ray diffraction studies show an increase in the intensity of diffraction peaks, decrease in FWHM and increase in crystallite size. The crystallite size values obtained are 11.3 and 58 nm for the anatase and rutile samples respectively. The optical absorption of these nanoparticles are investigated using UV-Visible and photoluminescence (PL) spectroscopic methods. The optical absorption spectra of TiO₂ sample exhibited strong absorption in the UV region. The band gap energy values obtained are 3.43 and 3.00 eV for the anatase and rutile samples respectively, in close agreement with the values obtained in other studies. The samples exhibit a strong and wide PL signal from 400 to 500 nm and a shoulder peak at 377 nm with an excited wavelength of 300 nm. Both the samples exhibit similar type of PL signal with no significant change in the curve shape. The emission intensity of anatase is higher than that of rutile sample.

This study reports the successful transformation from anatase to rutile phase of TiO₂ nanoparticles synthesized by sol gel method.

KEYWORDS: TiO₂ Nanoparticles, Anatase & Rutile Phase, Sol-gel Technique, Phase Transformation.