## **SAIP2025**



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## Effect of annealing temperature on structural, optical, and morphology properties of TiO2 synthesized via sol-gel method.

TiO2 nanoparticles (NPs) were synthesized using sol-gel method. The samples obtained were subsequently annealed at different temperatures from 450°C to 1200°C. The structural, optical, and morphological properties of TiO2 are investigated. The X-ray diffraction (XRD) results of as prepared revealed an amorphous structure. The annealed samples revealed a mixed phase of anatase and rutile, with rutile becoming more prominent as the temperature rose. The crystallite size increased from 3.183 nm to 35.328 nm. The macrostrain decreased from 2.5 to 0.21. The Fourier Transform Infrared (FTIR) also revealed the presence of the anatase and rutile phases. The Field Emission Gun Scanning Electron Microscopy (FEG SEM) showed a spherical shape of nanoparticles. The elemental composition of Ti and O was revealed by Energy-dispersive X-ray spectroscopy (EDX). The Transmittance Electron Microscopy (TEM) showed an irregular morphology shape at higher annealing temperatures. Photoluminescence (PL) spectra were used to analyze the optical properties of TiO2. TiO2 annealed at 600°C showed low PL intensity, whereas TiO2 annealed at 1200°C had the highest PL intensity.

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