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Track (SM): Advanced Semiconductors and Quantum Materials

Crystal structure, microstructure, optical, dielectric and magnetic property of TiO_2 nanoparticles

B. Dey*, S. K. Srivastava

[1]Department of Physics, Central Institute of Technology Kokrajhar, Kokrajhar-783370, India

***Corresponding Author E-mail:** *bikashdey2012@gmail.com

In this present work, Titanium dioxide (TiO_2) nanoparticles were synthesized by solid-state reaction method. Crystal structure study by the XRD pattern analysis confirms a single tetragonal rutile phase structure. The samples show uniform morphology with average particles size of 200 nm as per the scanning electron microscopy observations. The UV–Vis absorption data reveal that the optical band gap value of the prepared compound was found to be 2.94 eV. From the optical transmittance spectra, it is found that the samples display highly transparent behaviour. The field dependence of magnetization, or M-H data for the sample reveals a weak ferromagnetic behavior, with coercivity H_C=930 Oe and saturation magnetization M_S=0.002 μ_B per ion. Most likely, a very small fraction of localized unpaired 3d electrons in Ti^{3+} or oxygen vacancies [1-2] is thought to be responsible for this particular behavior. Dielectric properties observations reveal that the synthesized materials exhibit zero dielectric loss while operating in the higher frequency range, which is compatible with the Maxwell and Wagner model with Koop's theory.

References:

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