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Studies on optical and electrical properties of green synthesized TiO₂@Ag core-shell nanocomposite material(Article)

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Abstract

Newly adopted green approach has been used to synthesize pure titanium dioxide (TiO₂) nanoparticles (NPs) and silver deposited titanium dioxide (TiO₂@Ag) core-shell nanocomposite (CSNC) from Nigella Sativa (black cummin) seed extract for the first time. The phytochemicals available in Nigella Sativa (NS) seed extract acts as reducing agent in the formation of nanoparticles as well as nanocomposite. The morphology, crystal structure, particle size and phase composition of green synthesized TiO₂ NPs and TiO₂@Ag CSNC are investigated by High Resolution Transmission Electron Microscopy (HRTEM), Field Emission Scanning Electron Microscopy (FESEM), Powder x-ray diffraction (PXRD), FT-Raman and Fourier Transform Infrared spectroscopy (FT-IR). The red shift in (from 333 nm to 342 nm) UV-Vis spectrum confirmed the deposition of Ag on TiO₂. The reduced intensity peaks of Photoluminescence spectra (PL) also indicate the deposition of Ag on TiO₂. Further the electrical properties of pure TiO₂ and TiO₂@Ag CSNC have studied by dielectric studies and ac conductivity measurements. The dielectric constant and the dielectric loss of TiO₂@Ag CSNC are better than pure TiO₂. From these improved results, the green synthesized TiO₂@Ag CSNC from NS seed extract is may be a suitable material for device fabrication in the visible region. © 2018 IOP Publishing Ltd.

Author keywords

electrical properties nanocomposites nanoparticles UV-vis diffuse reflectance spectrum

Indexed keywords

Engineering controlled terms:

Crystal structure Deposition Dielectric losses Electric properties
Field emission microscopes Fourier transform infrared spectroscopy
High resolution transmission electron microscopy High-k dielectric Nanocomposites
Nanoparticles Oxides Particle size Phase composition Photoluminescence Red Shift
Scanning electron microscopy Shells (structures) Synthesis (chemical) TiO₂ nanoparticles
Titanium dioxide

Engineering uncontrolled terms

Core-shell nanocomposites Device fabrications Field emission scanning electron microscopy
Fourier transform infra red (FTIR) spectroscopy Optical and electrical properties
Photoluminescence spectrum Powder X-ray diffraction (pXRD) UV-vis diffuse reflectance spectra

Engineering main heading:

Silver compounds

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