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Studies on optical and electrical properties of green synthesized TiO_2@Ag core-shell nanocomposite material(Article)

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Abstract

Newly adopted green approach has been used to synthesize pure titanium dioxide (TiO_2) nanoparticles (NPs) and silver deposited titanium dioxide (TiO_2@Ag) core-shell nanocomposite (CSNC) from Nigella Sativa (black cumin) 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 TiO_2 NPs and TiO_2@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 TiO_2. The reduced intensity peaks of Photoluminescence spectra (PL) also indicate the deposition of Ag on TiO_2. Further the electrical properties of pure TiO_2 and TiO_2@Ag CSNC have studied by dielectric studies and ac conductivity measurements. The dielectric constant and the dielectric loss of TiO_2@Ag CSNC are better than pure TiO_2. From these improved results, the green synthesized TiO_2@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

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