TIO_2/GRAPHENE OXIDE NANO COMPOSITE THIN FILMS AND ITS PHYSICAL PROPERTIES FOR PHOTOVOLTAIC DOMAIN

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Abstract

TiO_2-Graphene Oxide (TiO_2-GO) nanocomposite thin films of different grades were successfully prepared using Titanium Tetra Isopropoxide (TIP) and Graphene Oxide (GO) nanosheet suspensions coated on a glass plate by a spin coating technique. TiO_2-GO nanocomposite film samples are thoroughly characterized for their morphology changes such as structure, shape, surface property, the thickness of films and band gap changes by coating a thin layer. XRD analysis revealed the amorphous nature of the deposited layers. SEM images demonstrated the growth and distribution of the layers with some spherical/rod-like structures and partially agglomerated. AFM study indicated that the films are smooth with slightly larger surface roughness. The analysis of optical absorption data showed that the values of band gap energy decreased from 3.46 eV to 1.40 eV with increasing dopant quantity. This reduction might be attributed to electron and/or hole trapping at the donor and acceptor levels in the TiO_2 band structure.

Transfer matrix method (TMM) study on the influence of the film thickness on the optical properties of Ti-G (10wt% GO) nanocomposite exhibited excellent properties of the film due to the inclusion of GO in the TiO_2 matrix, which would be promising for application in the photovoltaic application.

Keywords: TiO_2, Graphene Oxide, Composite thin films, Solar cells, Transfer Matrix Method (TMM).

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