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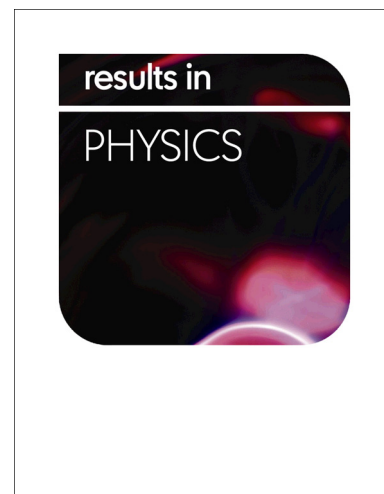
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The Development of TiO₂-Graphene oxide Nano composite thin films for solar cells

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Abstract

TiO₂-Graphene Oxide (TiO₂-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. TiO₂-GO nanocomposite film samples were thoroughly characterized for their morphology, thickness and band gap changes by coating a thin layer of 250 nm thickness on a 2cm x 2cm glass plate. XRD analysis revealed the amorphous nature of the deposited layers. SEM images demonstrated the growth and distribution of the grains 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 3.62 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 TiO₂ band structure.

Transfer matrix method (TMM) study on the film thickness influence on the optical properties of TiO₂-GO (10wt% GO) nanocomposite exhibited excellent properties of the film due to the inclusion of GO in the TiO₂ matrix, which would be promising for application in the photovoltaic application.

Keywords: TiO₂, Graphene Oxide, Composite thin films, Solar cells, Transfer Matrix Method (TMM).

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