

Graphene, Advanced 2D Materials & Semiconductors**Diamond, Graphite & Carbon Materials**

March 28-29, 2019 | Orlando, USA

ACCEPTED ABSTRACTS

JOURNAL OF NANOMATERIALS & MOLECULAR NANOTECHNOLOGY, VOLUME 8 | DOI: 10.4172/2324-8777-C2-060

TiO₂/graphene oxide nanocomposite thin films and its physical properties for the photovoltaic domain**A Timoumi^{1,2}, SN Alamri³, and H Alamri¹**¹Umm Al-Qura University, Saudi Arabia²National Engineering School of Tunis, Tunisia³Taibah University, Madinah, Saudi Arabia

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 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 3.46eV to 1.40eV 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 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 TiO₂ matrix, which would be promising for application in the photovoltaic application.

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