



## **Cadmium sulphide incorporated reduced Graphene oxide as counter electrode for dye sensitized solar cell**

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**Abstract:** Cadmium sulphide incorporated reduced graphene oxide as counter electrode material was synthesized from graphite using modified Hummer's method. Graphene oxide (GO), reduced graphene oxide (rGO), cadmium sulphide (CdS) and cadmium sulphide incorporated reduced graphene oxide (CdS - rGO) were synthesized by wet chemical methods. The synthesized GO was reduced to rGO using hydrazine hydrate as the reducing agent. The synthesized materials were characterized by XRD, FTIR, SEM, EDAX and UV- Visible absorbance spectroscopy. The XRD data confirmed the formation of GO from graphite. The crystallite grain size for all the synthesized materials were calculated from XRD data using Scherrer's formula as 35.1, 6.0, 9.2 and 4.5 nm for GO, r GO, CdS and CdS- rGO respectively. The FTIR spectra of CdS- rGO revealed peaks confirmed the presence of Cd-S bond. The morphology of synthesized samples of GO possessed a layered structure and CdS- rGO had interlaced layer structure. EDAX spectra revealed the presence of carbon and oxygen in GO and the presence of cadmium and sulphur along with carbon and oxygen in CdS- rGO. The UV- Visible spectra showed a red shift when GO was transformed to rGO and CdS-rGO. Dye sensitized solar cells (DSSC) were fabricated using TiO<sub>2</sub> as photoanode, synthesized materials as photocathode, I<sup>-</sup>/I<sup>3-</sup> as electrolyte and N 719 ruthenium dye as sensitizer. Fabricated DSSC's were subjected to I-V studies. The photoconversion efficiency was calculated and found that CdS- rGO showed maximum efficiency of 7.2%.

**Keywords:** Graphene oxide, reduced graphene oxide, CdS incorporated rGO, DSSC, photocathode.

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