Reduced Graphene Oxide Films – Production and Characterization for Application as Contact Layers in Solar Cells

Nowadays, reduced graphene oxide films are being applied in many technological purposes, even in renewable energy sources. This material can be considered less danger to health than others commonly used in photovoltaic modules, like indium (In), cadmium (Cd) and others. Graphene and its derivatives are being considered good candidates to replace traditional materials in thin films solar cells especially because their adequate electrical and optical properties, which enable the application of graphene films as transparent and conductive layers and also in back contact in these devices [1,2]. In this work, two different approaches were used. The first one was to produce graphene oxides films by a spray-coating automatized technique and then thermally reducing, resulting in thermally reduced graphene oxide (trGO). The second was to produce coatings from a dispersion of chemically reduced graphene oxide (rGO), using the same spray method. The films were characterized in respect to thickness, morphology, transmittance and resistivity, and the best candidates to work as front contact and back contact in CdS/CdTe solar cells were considered candidates for solar cell application. To improve the properties of front contact samples [3,4], the best approach was the reduction in H₂ atmosphere, while for the back contact it was to cover rGO films by spray with graphene flakes produced by liquid-phase exfoliation of graphite. By this way, rGO films were adequate to back contact (65.6 Ω/sq of sheet resistance), and rGO films showed the best results for front contact (5323 Ω/sq of resistance and 61.9% of transmittance).

References


Figures

**Figure 1:** Transmittance versus sheet resistance for frontal contact. ly.: layer, sp.: sputtering, e.g.: exfoliated graphene.

**Figure 2:** Sheet resistance for back contact.