

## Graphene oxide powders with different oxidation degree, prepared by synthesis variations of the Hummers method (Article)

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Graphene oxide (GO) powders with different oxidation degree estimated through the relative intensity of the infrared absorption bands related to oxygen containing groups were prepared through variations of the Hummers method. The GO powders were analyzed by Transmission Electron Microscopy, Energy dispersive spectroscopy, X-ray Photoelectron Spectroscopy, Fourier Transform Infrared Spectroscopy, Raman spectroscopy, X-ray Diffraction, UV-VIS spectroscopy and Electrical Resistance measurements. Several square micron GO sheets with low wrinkling were obtained. Oxygen to carbon ratio is around 0.2 in all the samples although a strong variance in the relative intensity of the oxygen related infrared bands is evident. Thus, the oxidation degree was estimated from the FTIR measurements using the quotient between the C-O related bands area to the total area under the spectra. FTIR shows presence of hydroxyl (-OH), epoxy (C-O-C), carboxyl (-COOH) and carbonyl (CO) moieties and evidence of intermolecular interactions between adjacent groups. These interactions influence the exfoliation degree, the absorbance of the GO suspensions, as well as the electrical resistance, while the crystalline domain sizes, estimated from XRD and Raman do not show a noticeable behavior related with the composition and molecular structure. The results indicate that the electrical resistance is influenced mainly by the surface chemistry of the GO powders and not only by the O/C ratio. The control of the surface chemistry of GO powders would allow their use as additives in organic bulk heterojunction solar cells with enhanced photoconversion efficiency. © 2015 Elsevier B.V. All rights reserved.

### Author keywords

Chemical synthesis; Electrical characterization; Graphene oxide; Molecular structure