UNDERSTANDING THE PHOTOELECTROCHEMICAL REDUCTION OF GRAPHENE OXIDE FILMS

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Graphene is a carbon single layer structure that shows remarkable electronic conduction properties, and therefore offers important perspectives as sensors, energy storage or heterogeneous catalysis. Graphene oxide (GO), its oxidized analogue can be functionalized by chemical modification, giving rise to a promising material in several fields of application [1]. GO can be reduced to reduced graphene oxide (rGO), and depending on the selected procedure, the resulting rGO will show a different structural defects and electronic properties.

The present study focuses on the use of electrochemical and photochemical processes to explore the reduction of graphene oxide thin films, with special emphasis on the characterization of the materials in terms of elimination of O-surface groups and appearance of structural defects. To attain this goal, graphene oxide prepared by the modified Hummers method [2,3], was spin-coated on glass/ITO substrates, and reduced using various irradiation conditions (UV, solar radiation) and electrochemical polarization in aqueous and organic electrolytes. The rGO materials were deeply characterized by UV-vis, Raman and X-ray photoelectron spectroscopy to analyze the final structure and composition. In all cases, the increase in the electronic conductivity of the rGO films after the removal of the O-groups was notable, particularly after the photochemical reduction.

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References

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