Electrochemical Response of Glassy Carbon Electrodes Modified using Graphene Sheets of Different Sizes

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In this study, we investigated the electrochemical behavior of reduced graphene oxide sheets (rGO) of different sizes deposited on glassy carbon electrodes. Graphene oxide sheets were produced by the exfoliation of graphite oxide in an aqueous solution by ultrasonication. Scanning electron microscopy and transmission-mode scanning electron microscopy results indicated a decrease in the size of the graphene oxide sheets with an increase in the exfoliation time or sonication power. The results of spectroscopic characterization corroborated with this behavior. X-ray diffraction analysis indicated a broadening of the peaks with crystallite size reduction while Raman spectroscopy results suggested an increase in the structural defects in the sp^2 framework of graphene oxide. Complementary X-ray photoemission spectroscopy analysis indicated a decrease in the sp^2/sp^3 ratio with respect to the amount of sp^2 framework in graphene oxide sheets upon decreasing the sheet size. Electrochemical analysis showed that the response of the GO-modified glassy carbon electrodes increased significantly with a decrease in the graphene oxide sheet size.

Keywords: graphene oxide; graphite oxide; Hummers' method; exfoliation time; electrochemical sensors

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