C Journal of Carbon Research

MDPI

Supplementary Informations

Dynamic Light Scattering measurements

All samples were prepared using a 4 mg/mL dispersion of graphene oxide (GO) in water, purchased from Sigma Aldrich (product number 777676, USA, St. Louis).

Dynamic Light Scattering (DLS) was used to characterize the size distribution of the GO particles in suspension. DLS is a widely used technique for determining the size distribution profile of small particles in suspension or polymers in solution. The measurements were conducted using a 35 mW HeNe laser (Spectra Physics model 127) that was linearly polarized and focused by a 300 mm focal length lens onto the sample cell, which consisted of a quartz cylindrical cuvette with a 2 cm inner diameter. The scattered light was collected at a 90° angle, with a light collimator using a 50 mm pinhole to ensure the system operated in a pure homodyne detection regime. The autocorrelation functions of the scattered light were processed by a Brookhaven Instruments 2030AT (New York, USA) digital correlator and inverted using the CONTIN routine to obtain the particle size distribution.

DLS measurements indicated that the GO particles, when suspended in water, had an average size distribution ranging between 500 to 700 nm. After sonication of the GO suspension in an ultrasonic bath for 30 minutes, DLS was repeated, but no significant increase in particle aggregation was observed. Figure S1 shows the particle size distribution determined through DLS at angle 90°.

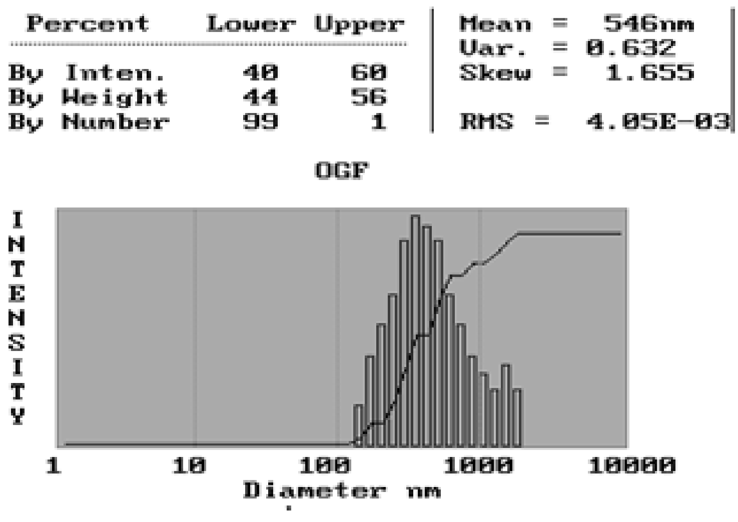

Figure S1 : Particle size distribution determined through DLS at angle 90°.

Energy Band Gap Calculation

The optical properties of the GO films were further analyzed by calculating the energy band gap from the transmittance spectra. Transmittance (T) is defined as:

$$T = \frac{I}{I_0} \quad (1)$$

For each wavelength of light passing through the spectrometer, the intensity of the light passing through the reference cell is measured. This is usually referred to as I_o

The intensity of the light passing through the sample cell is also measured for that wavelength , given the symbol, *I* . If *I* is less than *Io*, then the sample has absorbed some of the light (neglecting reflection of light off the cuvette surface).

The absorption of light by a substance in a solution can be described mathematically by the Beer-Lambert Law:

$$A = \varepsilon \mathrm{Md} \quad (2)$$

where: A is the absorption at a given wavelength of light, ε is the molar absorptivity, unique to each molecule and varying with wavelength, d is the path length through the solution that the light has to travel (1 cm in this case), and M is the the concentration of the solution in moles per liter (molarity).

The energy band gap was determined by performing a linear fit of the function $(\alpha hv)^2$, immediately above the absorption edge, with the band gap corresponding to the intercept of this linear fit with the photon energy axis. Figures S2 and S3 illustrate the energy band gap calculations for GO in water and isopropanol at representative concentrations.

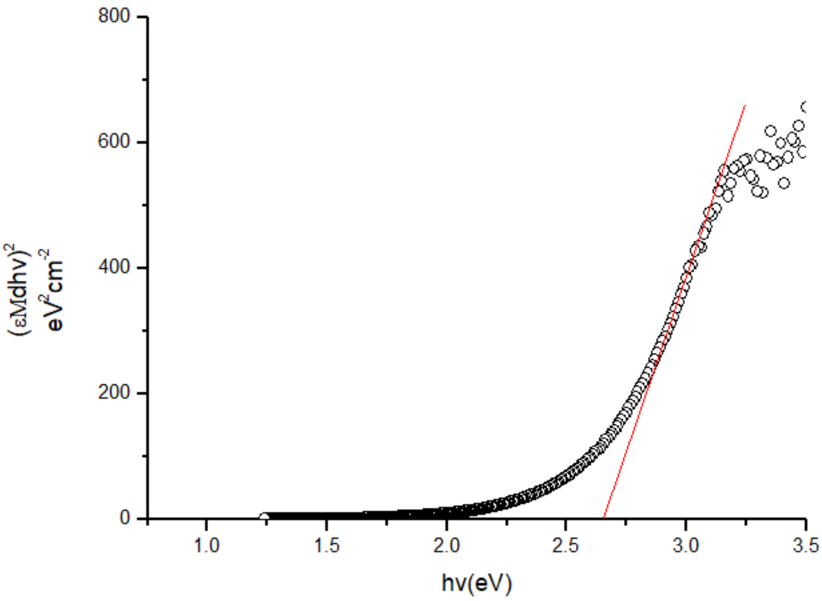

Figure S2: Energy band gap calculation of the solution of GO in water 0.5 mg/ml.

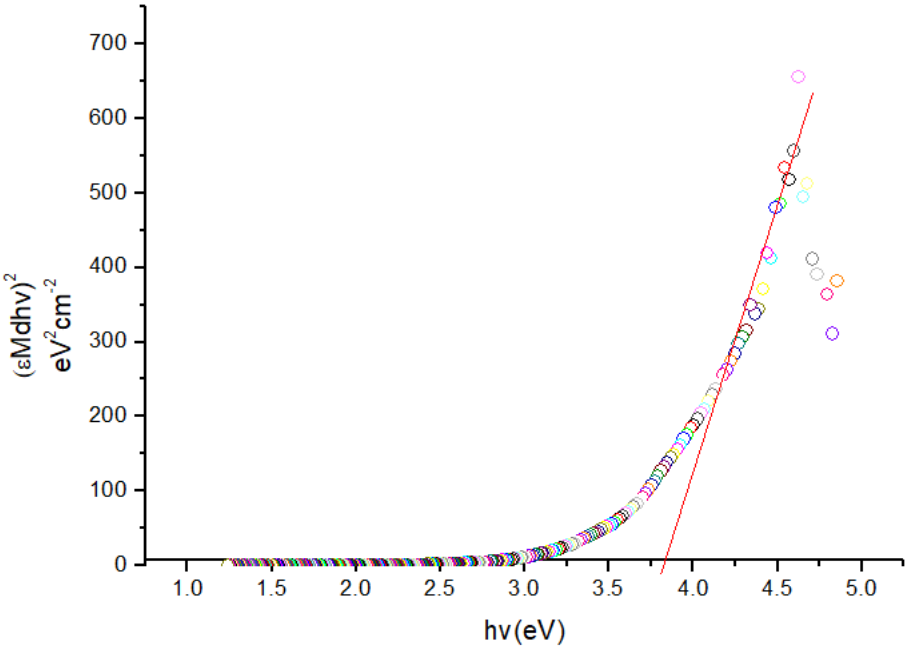

Figure S3. Energy band gap calculation of the solution of GO in isopropanol 0.1 mg/ml.