Thermal reduction of graphene oxide nanocomposite using a low temperature HDDR process for supercapacitors

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Recently, it has shown that the hydrogenation disproportionation desorption and recombination (HDDR) process can be an efficient method for the production of reduced graphene oxide for supercapacitors electrodes. The HDDR reduced graphene oxide was processed using a standard temperature (850ºC) for other materials applications. Some improvement in the specific capacitance and in the equivalent serial resistance has been obtained with this particular hydrogen thermal reduction process. The HDDR process has been considered a promising alternative method of reducing graphene oxide with efficiency and possibly in large scale production. A low temperature HDDR process was unreported for this purpose. In the present work, attempts of reducing a graphene oxide powder using a low temperature hydrogenation disproportionation desorption and recombination process (L-HDDR) has been carried out. A lower processing temperature in large scale production is significant as far as costs are concerned. Graphite oxide was prepared using a modified Hummers' method and dispersed in ethanol, exfoliated using ultrasonication to produce Graphene Oxide (GO). Investigations have been carried out by X-ray diffraction (XRD), scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). The experimental results of L-HDDR processing graphene oxide powder using unmixed hydrogen at 400°C and relatively low pressures (<2 bars) have been reported.

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