Sonochemical synthesis of reduced graphene oxide: methods and characterization

Reference	Presenter	Authors (Institution)	Abstract
01-058	Otavio Ishikawa	MOURA, E.A. (INSTITUTO DE PESQUISAS ENERGÉTICAS E NUCLEARES); Ishikawa, O. (Instituto de Pesquisas Energéticas e Nucleares); Mangieri, F. (Instituto de Pesquisas Energéticas e Nucleares); Bartolomei, M.R.(Instituto de Pesquisas Energéticas e Nucleares); Bartolomei, S.S.(FATEC - Sorocaba); Oliveira, R.R. (Nuclear and Energy Research Institute); Francisco, D.L. (Instituição de Pesquisas Tecnológicas do Estado de São Paulo); Guimarães, K. (Instituto de Pesquisa Tecnológica);	The reduction of graphene oxide (GO) by a safe and eco-friendly route, without the use of harmful chemicals, has drawn much attention as one of the most promising routes to produce graphene nanosheets, a 2D material with excellent electrical and thermal conductivity, optical and mechanical properties. Graphite exfoliation is widely performed by the chemical reduction of GO, which is commonly produced by oxidation of graphite using a strong oxidizing agent by Hummers' method. This work presents a study of the influence of sonochemical application on synthesis of reduced graphene oxide induced by UV radiation. Commercial graphite powder was used as raw material. Firstly, graphite powder was dispersed into a DMF/deionized water solution and ultrasonicated using a high intensity ultrasonic device for 1 8 hours in other to reduce the particle sizes. After, sonicated graphite samples were frozen for 24 hours and freeze-dried for 24 hours to obtain the powder. Graphite powder obtained with different particle sizes was used to prepared GO through a chemical route. GO prepared was dispersed into a DMF/deionized water solution, ultrasonicated using a high intensity ultrasonic device for 1-2 hours, frozen for 24 hours and freeze-dried for 24 hours. Finally, GO powder samples were dispersed in a mixture of isopropyl alcohol, acetone, and deionized water and irradiated using UV radiation by different irradiation time to obtain reduced GO (RGO). The GO and RGO were characterized by BET, ATR–FTIR, XRD, Raman, TG, and FE-SEM analysis. In addition, graphite samples were characterized by BET, SEM and XRD analysis. The results showed that sonochemical application has a fundamental role in the synthesis of GO nanosheets and RGO. Ultrasonically prepared GO exhibited higher surface area, higher crystallinity and higher oxidation efficiency with many hydrophilic groups. FE-SEM analysis of the GO showed that sonochemical application reduced the aggregated domains and close stacking of sheets on the GO surface and led to obtaining reduced GO with a smooth surface, fewer layers and significant effective surface area.

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