

IMPROVEMENT OF THE MODIFIED HUMMER'S METHOD FOR THE SYNTHESIS OF GRAPHENE OXIDE

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Graphene oxide (GO), often called graphitic acid or graphitic oxide has been widely studied in the last decades. Hummer's method has been the most frequently used route for preparing graphene oxide; it consists of carrying out a reaction among graphite powder, concentrated nitric acid and potassium permanganate. Recently, a new procedure for the GOs synthesis has been proposed by J. Song et al. In general, these methods involve concentrated acids and strong oxidants that produce explosive exothermic reactions. We have realized that, by increasing the amount of KMnO_4 , excluding the NaNO_3 and adding a mixture of $\text{H}_2\text{SO}_4/\text{H}_3\text{PO}_4$ in proportion 9:1, the efficiency of the oxidation process is improved. Also, the acid character of the GO can be eliminated by increasing the concentration of H_2O_2 during the reaction, this reactant besides diminishes the quantities of water, hydrochloric acid and ethanol used during the washing process of GO.

Also the filtering and centrifuging procedures recommended in the Hummer's and modified Hummer's methods can be eliminated. Furthermore, by carrying out a thermal treatment under nitrogen flux in an oven, the overall time of GO synthesis is reduced. These improvements do not generate toxic gases, the annealing process is easily controlled and as a result a greater amount of hydrophilic oxidized graphene material is obtained compared to the one obtained by the Hummers method.

Keywords: Graphene oxide, obtaining process, Hummer's method

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