OPTIMIZATION OF THE MECHANOCHEMICAL SYNTHESIS OF GRAPHENE OXIDE AND ITS CHARACTERIZATION. APPLICATION TO THE SYNTHESIS OF MAGNETIC GRAPHENE OXIDE

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Abstract

Nowadays, the use of materials derived from graphene oxide (GO) is extended in the technologycal industry and research due to their excellent physico-chemical properties. This fact invites us to investigate a sustainable synthesis of GO and its derivatives according to the postulates of the so-called "green chemistry". Recently, the mechanochemical synthesis of graphene oxide (GO) has been postulated as a sustainable alternative for the preparation of GO using graphite as starting material and a planetary ball mill (Fig. 1). In this work, an optimization has been carried out based on the comparative study of the use of balls of different diameters as well as different operating protocols of the mill. The obtained GO obtained have been adequately characterized by elemental analysis, SEM and TEM images, XPS spectra and the nitrogen adsorption-desorption isotherms. The results obtained from the characterization have allowed us to verify the goodness of the method used, confirming that the synthesis is possible not only on a laboratory scale but also on an industrial level. This "dry" synthesis complies with the recommendations included in the 2019 IUPAC report, which indicated the chemical techniques that would make our planet a more sustainable place. Finally, magnetic graphene oxide (M@GO) has been obtained by coupling magnetic nanoparticles with GO synthesized by the optimized mechanochemical protocol, demonstrating an excellent capacity of adsorption towards several contaminant.

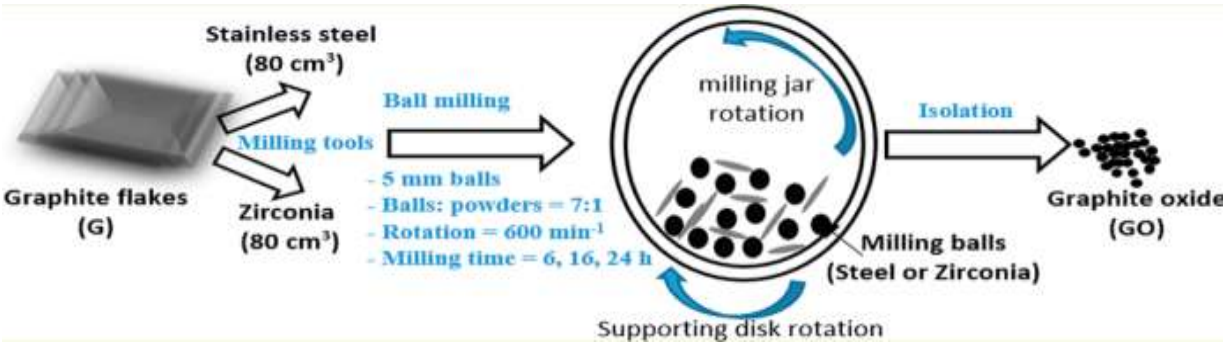

Fig. 1 Mechanochemical synthesis of GO [1]

Keywords

Graphene oxide; Mechanochemistry; Characterization; Magnetic graphene oxide

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Reference

[1] Mahmoud, A., Stolle, A. y Stelter, M., "Sustainable Synthesis of High-Surface-Area Graphite Oxide via Dry Ball Milling", 6 ACS Sustainable Chem. Eng., 6358−6369 (2018).