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Functionalization of Graphene Oxide for Industrial Applications

Graphene and its functional derivatives (GO and rGO) have attracted attention in the scientific community owing to their remarkable chemical and physical properties. [1] Importantly, the excellent electrical and thermal conductivity of these compounds has opened new possibilities in scientific fields such as electrochemistry, optics, capacitors and biological sensing. Particularly, graphene oxide, an oxidized graphite sheet containing oxygen-type functionalities, both on the basal plane and on the edge, offers a unique opportunity to modulate the chemical and physical properties by modification and engineering of its surface. [2],[3]. In this work graphene oxide was prepared using Hummer's methodology. [4] Subsequently, it was chemically modified using appropriate organic or inorganic molecules. In one example; GO is functionalized using an amino based polymer such as polyethyleneimine (PEI), covalently forming an amide with the carboxylic acid residues on the GO (Figure 1). [5] The reduction of GO was also explored using an economical and environmentally friendly electron source: ascorbic acid. These approaches (reduction and surface modification) represent excellent opportunities for the fine tuning of the chemical and physical characteristics of GO and rGO to confer the desired properties into the material. Finally, different methodologies are employed to characterize and define these modified materials (GO/rGO) in order to allow a systematic study of the morphological, structural and functional state of the new materials. Various techniques were employed for this purpose, such as FT-IR, SEM, XPS, XRD; NMR solid state, FT-Raman and TGA.

References

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Figures

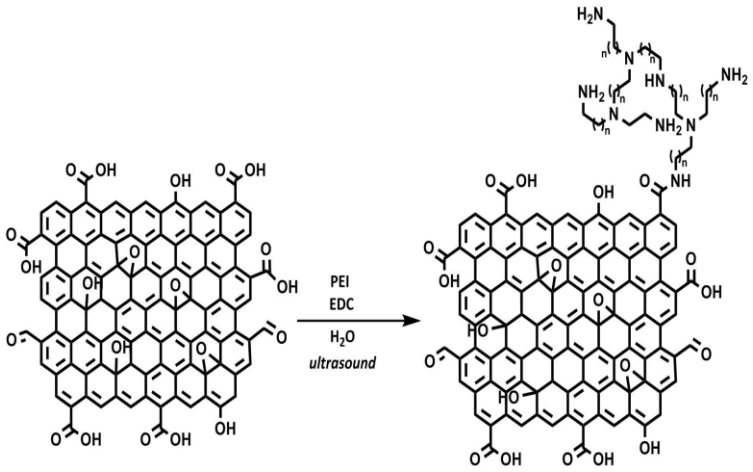

Figure 1: General scheme for GO functionalization with polyethyleneimine (PEI).