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Synthesis and Characterization of an Aerogel Based on Graphene Oxide and Polyethylene Glycol

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Abstract : Graphene, and its derivatives such as graphene oxide (GO), are emerging nanoscopic materials, with interesting physical and chemical properties. From them, it is possible to develop three-dimensional macrostructures, such as aerogels, which are characterized by a low density, high porosity, and large surface area, having a promising structure for the development of materials. The use of GO as a precursor of these structures provides a wide variety of materials, which can be developed as a result of the functionalization of their oxygenated groups, with specific compounds such as polyethylene glycol (PEG). The synthesis of aerogels of GO-PEG for non-covalent interactions has not yet been widely reported, being of interest due to its feasible escalation and economic viability. Thus, this work aims to develop a non-covalently functionalized GO-PEG aerogels and characterize them physicochemically. In order to get this, the GO was synthesized from the modified hummers method and it was functionalized with the PEG by polymer-assisted GO gelation (crosslinker). The gelation was obtained for GO solutions (10 mg/mL) with the incorporation of PEG in different proportions by weight. The hydrogel resulting from the reaction was subsequently lyophilized, to obtain the respective aerogel. The material obtained was chemically characterized by analysis of Fourier transform infrared spectroscopy (FTIR), Raman spectroscopy and X-ray diffraction (XRD), and its morphology by scanning electron microscopy (SEM) images; as well as water absorption tests. The results obtained showed the formation of a non-covalent aerogel (FTIR), whose structure was highly porous (SEM) and with a water absorption values greater than 50% g/g. Thus, a methodology of synthesis for GO-PEG was developed and validated.

Keywords : aerogel, graphene oxide, polyethylene glycol, synthesis
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