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MULTIFUNCTIONAL GRAPHENE-BASED NANOMATERIALS FOR REMOVAL OF DIVERSE WATER CONTAMINANTS

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Abstract

Limitations in the conventional water treatment techniques has been driving awareness of researchers to find alternative approaches for water treatment and contaminant removal. Based on these premises, with the increasing interest in sustainable, less energy-intensive technologies, graphene-based nanomaterials have gained a lot of attention due to their unique properties in a wide range of applications. From a wide array of graphene-based materials, graphene and graphene oxide (GO) have taken a central focus due to its impressive physical and chemical properties, as well as its scalable production. The present cascade of studies aims to explore the properties of graphene for biofouling control, as well as the inclusion of GO into a polymeric matrix to develop a new class of nanocomposite for contaminant removal. A novel technique to remove biofouling by laser irradiating biofouled graphene-coated membrane surfaces was developed. A laser beam was used to heat the graphene structure, resulting in the microbial fouling to burn out, allowing the modified membrane to be used for several filtration cycles. Later the studies were focused in the incorporation of GO into a polymeric matrix containing chitosan (CS) and polyethyleneimine (PEI) to form nanocomposite as membrane coating and beads. The optimized CS-PEI-GO nanocomposites were investigated against diverse water chemistries showing its stability and effectivity, paving the way to the development of a technology that is applicable in real-world situations.