Synthesis of graphene based nano composite for removal of toxicants from water

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Abstract

Large scale manufacturing and processing of materials for various application generate huge amount of organic and in organic waste, which leads to the deterioration of our natural resources like water and soil [1]. Therefore, concrete steps must be taken for treatment of toxicant. The synthesis of graphene-based nanocomposites and their applications in removing toxicants from water signify advancing area of environmental nanotechnology. Graphene and its derivatives are promising building blocks for nanocomposites due to their exceptional physicochemical properties, including very high specific surface area, abundant oxygen-containing functional groups, strong π–π interactions, and excellent mechanical and chemical stability [2]. These features make graphene-based materials highly effective adsorbents and catalytic supports for capturing and degrading a broad spectrum of water pollutants, such as heavy metals, organic dyes, explosives, and others persistent pollutants. Here, synthesis of scalable graphene oxide (rGO) and its nano-composites ($Fe^{(0)}$-rGO, Fe_2O_3-rGO, TiO_2-rGO, SiO_2-rGO and Rayon-rGO) developed at CFEES and its application for removal of explosive (TNT, RDX,HMX and DNA), heavy metal (Hg) and dyes (EBT, Methylene blue) is being discussed [3-5]. The synthesized nano-composites were characterized for morphological, physical, chemical, and thermal analysis. The morphological characterization of the nano-composites confirmed uniform distribution of nanometal/nano-metal oxide. Reyon-rGO nano-composite was synthesized to provide stability of rGO on the rayon surface. Its efficiency towards removal of toxicants were analyzed by UV-Vis spectroscopy and Atomic Adsorption Spectroscopy (AAS) using batch adsorption techniques. The high surface area of nano-composite along with catalytic properties makes the composite material suitable for removal/degradation of toxicants.

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