Synthesis of Graphene Oxide from Graphite for Water Treatment

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Carbon containing materials are typically used as an adsorbent for water treatment, specially to remove heavy metals, toxic anions, and dye stuffs. In this research, graphene oxide is synthesized from graphite using modified Hammers method for lead removal application. Synthesized grapheme oxide is identified by high resolution thermogravimetric (HR-TGA) studies where graphene oxide tends to decompose in the temperature range of 570-640 ^{o}C. Surface properties of graphene oxide including the specific surface area, total pore volume, pore width, single point pore volume, microporous volume is measured by using nitrogen adsorption desorption analyzer at -196 ^{o}C using liquid nitrogen and calculated those properties using KJS (Kruk Jaroniec, Sayari) method. Total pore volume, specific surface area, pore width, single point pore volume, microporous volume of graphene oxide, respectively, are ~ 0.24 $cm^3 g^{-1}$, 41 $m^2 g^{-1}$, 7.6 nm, 0.22 $cm^3 g^{-1}$, and 0.01 $cm^3 g^{-1}$. Synthetic lead solutions are used to study the adsorption and kinetic behavior of graphene oxide. Lead ion concentration are measured using atomic adsorption spectrophotometer. Kinetic sorption reveals that 2-3 hour is required to achieve the equilibrium condition. Graphene oxide adsorption process is well fitted with pseudo-second-order kinetic model than pseudo-second-order showing regression coefficient value (R^2) of 0.9991 and reached to the adsorption capacity of 100 mg g^{-1}.

Keywords: Graphene Oxide; Adsorption; Lead Removal