When Graphene Combines Cotton: Study on Synthesis of Adsorption Materials for the Removal of Marine Hazardous Chemicals

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An increasing number of leakage incidents have been reported when shipping chemicals and these leaked chemicals have caused irreparable damage to the marine environment. In the present work, a new adsorbent material was prepared based on the combination of graphene and cotton, two materials that exhibit good adsorption properties. Cotton was immersed in the graphene oxide dispersion solution and extruded repeatedly to form a graphene oxide/cotton complex. Finally, a super-hydrophobic and super-lipophilic graphene/cotton composite aerogel was prepared by lyophilization and reduction. The adsorption and cycle properties of graphene/cotton composite aerogel were tested. The results showed that the composite aerogel was super-hydrophobic and super-lipophilic. The aerogel could completely absorb the cetane oil droplets in 0.16 seconds when it touched the surface of the aerogel. The saturated adsorption capacity of the composite aerogel was in the range of 130 to 180 g/g, and the adsorption amounts to toluene, dodecane, acetone, nitrobenzene and styrene were 139, 142, 133, 123 and 147 g/g, respectively. The adsorption amounts were much higher than the saturated adsorption amounts of cotton or graphene aerogel alone. And the cycle performance test results of the composite aerogel showed that the adsorption capacity of the sample changed little after 10 cycles. In addition, through combining Fe_3O_4 with cotton and graphene, the material became magnetic, thus can be more convenient to collect and recycle.

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