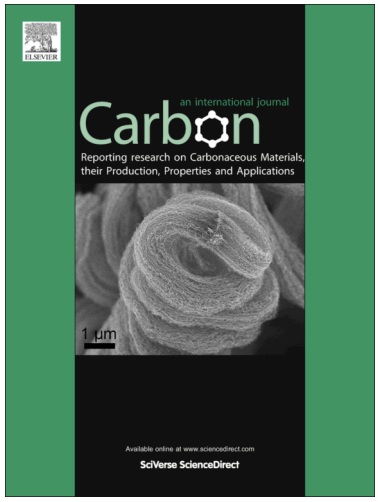

Water-Dispersible Magnetic Nanoparticle–Graphene Oxide Composites for Selenium Removal

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Water-Dispersible Magnetic Nanoparticle−Graphene Oxide Composites for Selenium Removal

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Abstract

Selenium ions are toxic at concentrations of >40 ppb (40 μg L^{-1}) which has been a very challenging environment issue. Compared to Se (IV), Se (VI) is more bioavailable and much more difficult to be removed from water. Conventional adsorbent materials only show well defined removal capacity for Se (IV) while perform poorly for Se (VI) (typical removal percentage <50%). In this report, functionalized water-dispersible magnetic nanoparticle−graphene oxide (MGO) composites were synthesized, characterized and applied to remove selenium ions (both Se (IV) and Se (VI)) in aqueous system. MGO (dosage 1 g L^{-1}) shows removal percentage of >99.9% for Se (IV) and ~80% for Se (VI) from water (pH 6-7) within 10 seconds. Effect of pH ranging from 2 to 11 was investigated, and the results show that acidic pH enhances the adsorption of selenium ions on MGO resulting in an increased removal percentage of Se (VI) to >95% at pH~2. MGO can be separated effectively under an external magnetic field and recycled for reuse in water treatment. Our results show that MGO composites have favorable removal capability of both selenite and selenate in water with important potential practical applications in removing selenium from wastewater.

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