Synthesis, treatment, and application of a novel carbon nanostructure for removal of fluoride from aqueous solution

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ABSTRACT

In this research, a new carbon nanostructure was prepared by chemical vapor deposition method on the surface of kaolin disks. Cyclohexanol and ferrocene were respectively used as carbon source and catalyst. In order to enhance the adsorption capacity of carbon nanostructure for fluoride adsorption, the disks were treated with 1 M KOH at reflux conditions. The scanning electron microscopy image showed that “sword like” nanostructures with 70 nm in diameter and 7030 nm in length were formed on the surface of kaolin. The Infrared spectra of the treated sample revealed that the hydroxyl and carboxyl groups were produced on the surfaces. The surface functional groups were determined by the Boehm titration. Adsorption experiments indicated that removal of fluoride by the treated sample was pH dependant and under optimized condition 230.61 meq/g of $F^-$ was adsorbed, which was beyond of the capacity of the earlier studied adsorbents.

Keywords: Chemical vapor deposition; Carbon nanostructures; Adsorption; Fluoride; Surface treatment; Boehm’s titration; pH(PZC)

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