Quick removal of arsenic from ultra-low concentration solution using iron oxide-chitosan composite fibers

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Arsenic contamination in drinking water sources is one of the major environmental concerns in the world. In this study, a green adsorbent, iron oxide-chitosan composite fibers (ICFs), was prepared and used for the removal of As(V) and As(III). As increasing the iron content, the removal efficiency was enhanced, indicating that iron plays a major role for arsenic removal. According to the Langmuir model, the maximum adsorption capacities of the ICFs with 35.82% (w/w) iron content for As(V) and As(III) were evaluated to be 30.76 ± 2.36 and 95.17 ± 3.96 mg/g at pH 7.0, respectively. The XPS analysis of ICFs and As-loaded ICFs indicated that Fe-OH in the adsorbent was the main binding site. Water purification potentials of ICFs was performed from 1000 ppb initial concentration at 1g/L sorbent. The residual concentration of arsenic could meet the WHO standard for drinking water (<10 ppb) while common anions at the normal level, and the adsorption rate for As(V) and As(III) reached below 10 ppb within 50 and 240 mins respectively. Overall, newly-fabricated ICFs could be considered an effective adsorbent to remove arsenic from the aquatic environment.