Removal of heavy metals by immobilized magnetite nano-particles

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ABSTRACT

Nano-sized magnetite homogenous porous layer was immobilized onto modified granular activated carbon and used as an adsorbent for copper (Cu(II)) and chromium (Cr(VI)). Batch adsorption experiments revealed high efficiency for both metals removal attaining maximum adsorption capacity of 590 mg/g Fe. Significant difference in the reaction kinetics was found between the two metals suggesting that the magnetite affinity towards the copper was much higher than for chromium. These results were explained by the different mechanism at which the metals were adsorbed by the immobilized magnetite nano-particles layer. It was concluded that initially the metals were adsorbed by the active sites on the magnetite surface, and then diffused into the interior pores of the nano-magnetite layer. It was demonstrated that the latter was the rate-determining step for the process. Fixed-bed continuous experiments revealed the potential to reuse the nFe-GAC through three consecutive sorption and desorption cycles of copper.

Keywords: Activated carbon; Adsorption; Copper; Hexavalent chromium; Iron oxide

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