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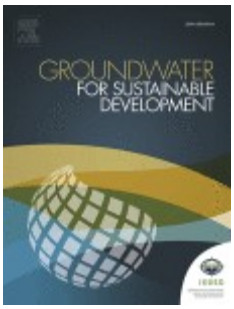

Magnetite nanoparticles incorporated porous kaolin as a superior heavy metal sorbent for water purification

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ABSTRACT

Water pollution has become one of the key global environmental problems. Heavy metal ions are major pollutants of water. Therefore, this research is focused on fabrication of high-efficient heavy metal adsorbing filter for water purification using low cost materials. The filtering material has been fabricated by incorporating co-precipitated magnetite nanoparticles into the micro-porous kaolin granules. The porosity of the magnetite nanoparticles incorporated kaolin granules (NPIKG) is obtained by burning well ground rice husk at 6500○C for 3 h. The synthesized NPIKG adsorbent efficiently adsorb heavy metal cations of lead and cadmium. The adsorption for Pb^{2+} and Cd^{2+} ions are evaluated according to a series of initial metal ion concentrations from 10.00 ppm - 100.00 ppm and contact time ranges from 2 h - 24 h for bare kaolin granules (KG) and NPIKG. Characterization of samples involved FTIR, XRD, AAS, SEM and TEM analytical techniques. Both types of adsorbents fitted well with Freundlich adsorption isotherm model than Langmuir isotherm. Adsorption capacity ranges of Pb^{2+} and Cd^{2+} for NPIKG according to Langmuir isotherm are 294-909 and 1111-3333 mg/kg respectively. Similarly, adsorption capacity ranges of Pb^{2+} and Cd^{2+} for KG are 256-555, 909-2500 mg/kg respectively. Iron leaching of the fresh NPIKG is zero and already used NPIKG is less than 2 mg/kg. Desorption of Pb^{2+} and Cd^{2+} ions is very low in NPIKG compared to KG adsorbent. Therefore, both types of kaolin adsorbents are suitable for heavy metal adsorption from polluted water for the purification of water.

Keywords Magnetite nanoparticles, heavy metal sorbent, water purification

Citation preview

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