

Arsenic removal from water by magnetic $\text{Fe}_{1-x}\text{Co}_x\text{Fe}_2\text{O}_4$ and $\text{Fe}_{1-y}\text{Ni}_y\text{Fe}_2\text{O}_4$ nanoparticles

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Abstract: This article studies the effects of Co and Ni replacement in $\text{Fe}_{1-x}\text{Co}_x\text{Fe}_2\text{O}_4$ and $\text{Fe}_{1-y}\text{Ni}_y\text{Fe}_2\text{O}_4$ ($x, y = 0, 0.05, 0.1, 0.2, 0.5$) nanoparticles, pH, weight of nanoparticles/mL of water, and time of stirring on the arsenic removal ability. The results showed that a small amount (0.25 g L^{-1}) of Fe_3O_4 nanoparticles after stirring time of 3 min can reduce the arsenic concentration from 0.1 to 0.01 mg L^{-1} . The removal was also affected by the pH of the water. Absorption of arsenic by nanoparticles was effective when pH was smaller than seven and reduced with the increase of pH. At pH of 13, there was a strong release of arsenic ions from arsenic-absorbed nanoparticles back to water. The time of stirring was studied from 1 min to 2 h and the optimal time was about few minutes. Co and Ni's presence was reported to keep saturation magnetisation stable under working conditions. For Co replacement, absorption does not change significantly when $x \leq 0.1$ and slightly reduces when $x > 0.1$. The presence of Ni improved the absorption in most cases.

Author Keywords: Arsenic removal; Ferrites; Magnetic nanoparticles; Water treatment

Index Keywords: Arsenic concentration; Arsenic ions; Arsenic removal; Magnetic nanoparticles; Magnetisation; Optimal time; Working conditions; Absorption; Arsenic; Dewatering; Ferrite; Gyrotors; Nanoparticles; Nickel; Saturation magnetization; Water recycling; Chemicals removal (water treatment); arsenic; carbonic acid; ferrite; magnetite; nickel; superparamagnetic iron oxide nanoparticle; adsorption; article; concentration (parameters); controlled study; heavy metal removal; magnetism; molecular weight; nanoanalysis; nanochemistry; nanoimaging; nanotechnology; particle size; pH; priority journal; process development; transmission electron microscopy; water management; water treatment; X ray diffraction

Year: 2009

Source title: Journal of Experimental Nanoscience

Volume: 4

Issue: 3

Page : 253-258

Cited by: 1

Link: Scopus Link

Chemicals/CAS: arsenic, 7440-38-2; carbonic acid, 3812-32-6, 463-79-6; ferrite, 11138-11-7, 12009-00-6, 1317-54-0; magnetite, 1309-38-2, 1317-61-9; nickel, 7440-02-0

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ISSN: 17458080

DOI: 10.1080/17458080802590474

Language of Original Document: English

Abbreviated Source Title: Journal of Experimental Nanoscience

Document Type: Article

Source: Scopus

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