Arsenic removal from water by magnetic $Fe_{1-x}Co_x Fe_2O_4$ and $Fe_{1-y}Ni_y Fe_2O_4$ nanoparticles

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Abstract: This article studies the effects of Co and Ni replacement in $Fe_{1-x}Co_xFe_2O_4$ and $Fe_{1-y}Ni_yFe_2O_4$ (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 $Fe_3 O_4$ 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
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