Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2021.26552

210 (2021) 273–280
January

Removal of humic acid from aqueous media using magnetite nanoparticles

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Received 7 April 2020; Accepted 6 September 2020

ABSTRACT

Humic acid is one of the predominant organic substances in both surface and ground waters, creating an unpleasant taste and color in water. It is one of the most important precursors of disinfection by-products. Magnetite nanoparticles were synthesized through the chemical precipitation method. Removal of humic acid from aqueous solutions using magnetite nanoparticles was compared with commercial hematite nanoparticles by changing the effective parameters including pH, nanoparticle dosage, humic acid concentration, reaction time, and temperature. Moreover, the adsorption isotherms were evaluated using Langmuir and Freundlich models. The results showed that by increasing pH from 3 to 11, the efficiency of both nanoparticles decreased. The highest performance of nanoparticles was achieved at pH = 3, nanoparticles dosage of 0.25 g/L, and contact time of 90 min. The isotherm graphs and linear regression coefficient values indicated that adsorption using hematite and magnetite fits the Langmuir models. The kinetic study showed that the adsorption using both hematite and magnetite follows second-order-kinetics. Both synthesized magnetite and commercial hematite show good performance for the removal of humic acid.

Keywords: Humic acid; Magnetite; Nanoparticles; Adsorption

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