*Desalination and Water Treatment*
www.deswater.com

doi: 10.5004/dwt.2022.28141

252 (2022) 219–232
March

# Magnetic carbon nanocomposite derived from waste tire rubber for atrazine removal from aqueous solutions

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Received 26 May 2021; Accepted 19 December 2021

**ABSTRACT**

In this study magnetite nanoparticles ($Fe_3O_4$) were synthesized and embedded in activated carbon (AC) derived from waste tire rubber to produce magnetic activated carbon. The atrazine ($C_8H_{14}ClN_5$) adsorption was performed over ($AC/Fe_3O_4$) nanocomposite in an aqueous solution and adsorption isotherms and kinetics were determined. The effects of some parameters such as (pH, contact time, adsorbent dosage and initial pesticide concentration) were investigated. Characterization of nanocomposite was carried out by high-resolution scanning electron microscopy and transmission electron microscopy, X-ray powder diffraction, vibrating sample magnetometer, Brunauer–Emmett–Teller, Fourier-transform infrared spectroscopy (FTIR), energy-dispersive X-ray spectroscopy, and zeta potential analyses. The characterization results showed that the synthesized composite has a mesoporous cubic structure along with narrow size distribution of uniform $Fe_3O_4$ particles in the carbon matrix. The composite showed super magnetic behavior considering to its low coercivity (2.44 Qe) and high saturation magnetization (36.43 emu $g^{-1}$). The FTIR spectra exhibited successful bonding of iron ions on activated carbon surface. The adsorption study showed that the atrazine concentration reached to equilibrium after 220 min, and the optimum atrazine removal was 76% at pH = 8, 1 g $L^{-1}$ adsorbent dosage, and 15 mg $L^{-1}$ of atrazine concentration. The adsorption data fitted Langmuir model and showed a higher correlation with pseudo-second-order reaction.

*Keywords:* Atrazine; Adsorption process; Magnetic nanocomposite; Aqueous solutions; Waste tire rubber; Persistent organic pollutant

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