

Poly-NIPAM/Fe₃O₄/multiwalled carbon nanotube nanocomposites for kerosene removal from water

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Streszczenie

Multiwalled carbon nanotubes (MWCNTs) were oxidized using a mixture of H₂SO₄ and HNO₃, and the oxidized MWCNTs were decorated with magnetite (Fe₃O₄). Finally, poly-*N*-isopropyl acrylamide-co-butyl acrylate (P-NIPAM) was added to obtain P-NIPAM/Fe/MWCNT nanocomposites. The nanosorbents were characterized by various techniques, including X-ray diffraction, transmission electron microscopy, scanning electron microscopy, thermogravimetric analysis, and Brunauer–Emmett–Teller analysis. The P-NIPAM/Fe/MWCNT nanocomposites exhibited increased surface hydrophobicity. Owing to their higher adsorption capacity, their kerosene removal efficiency was 95%; by contrast, the as-prepared, oxidized, and magnetite-decorated MWCNTs had removal efficiencies of 45%, 55%, and 68%, respectively. The P-NIPAM/Fe/MWCNT nanocomposites exhibited a sorbent capacity of 8.1 g/g for kerosene removal from water. The highest kerosene removal efficiency from water was obtained at a process time of 45 min, sorbent dose of 0.005 g, solution temperature of 40 °C, and pH 3.5. The P-NIPAM/Fe/MWCNTs showed excellent stability after four cycles of kerosene removal from water followed by regeneration. The reason may be the increase in the positive charge of the polymer at pH 3.5 and the increased adsorption affinity of the adsorbent toward the kerosene contaminant. The pseudo second-order model was found to be the most suitable model for studying the kinetics of the adsorption reaction.

Słowa kluczowe

MWCNTs, Magnetite, Poly-*N*-Isopropyl acrylamide-co-butyl acrylate (P-NIPAM), Kerosene removal, Nanocomposite

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