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Original Research Article

Removal of Oil from water Surfaces via Recyclable NiFe₂O₄/Polyurethane Sponge

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ABSTRACT

In an attempt to develop the methodologies used for oil spill clean-up, polyurethane sponge was modified by deposition of NiFe₂O₄ nanoparticles on the surface of the original polyurethane sponge under ultrasonic treatment. The fabrication process was facile and low-cost. The as-prepared magnetic sponge exhibited remarkable features including great porosity, high oil adsorption capacity, hydrophobicity, and reusability. In addition, the magnetic property of the modified sponge facilitated the process of oil-water separation. Indeed, the hydrophobicity of the modified sponge contributed to the adsorption of different types of oil and organic solvent on the sponge surface. The modified sponge exhibited the same characteristic peaks as those of the NiFe₂O₄ magnetic nanoparticles, ascertaining the formation of the crystalline nickel ferrite nanoparticles. The XRD and FTIR results proved the formation of the composite. FESEM images of the nanocomposite showed a highly porous mulberry-like structure with a rough skeleton. More importantly, the oil and water contact angle measurements proved the hydrophobicity of the modified sponge.

Keywords: Polyurethane, oil adsorption, sponge, reusability, magnetic separation, NiFe₂O₄ nanoparticles, oil removal