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Selective separation of methyl orange from water using magnetic ZIF-67 composites

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ABSTRACT:

Efficacious and convenient removal of organic dye contaminants from wastewater is a challenge for public health and ecosystem protection. Here we fabricate a novel type of Fe₃O₄@MOFs (Metal-organic frameworks) magnetic porous composite materials. ZIF-67 (Zeolitic imidazolate framework-67) nano-crystals as an attractive subfamily of MOF was selected to fabricate Fe₃O₄-PSS@ZIF-67 composites (defined as MZIF-67). MZIF-67 composites are core-shell structure, for which the aggregation core of Fe₃O₄ nanoparticles is coated with petal-like ZIF-67 crystals, in which Co²⁺ firstly combines with SO₃²⁻ provided by PSS (poly (styrenesulfonate, sodium salt)) to form nucleation. MZIF-67 composites perform well on methyl orange (MO) adsorption, which could be attributed to the highly porosity and the nature of Lewis base of coordinated Co²⁺ centrals. The results show that the equilibrium adsorption capacity for MO is up to 738 mg·g⁻¹ (when pH =8.0, contact time is 7 h, adsorbent dose is 5 mg and initial MO concentration is 400 mg·L⁻¹). In addition, MZIF-67 composites could selectively separate MO from the mixture solution of MO and MB (methylene blue). The removal rate of MO is up to 92%. The concentration ratio of MO/MB is 0.04. And the separation efficiency is up to 96%. The results suggest MZIF-67 composites could be a good candidate for

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