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Sustainable and Shaped Synthesis of MOF Composites Using PET Waste for Efficient Phosphate Removal

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The exploration of metal–organic frameworks (MOFs) in the adsorption of phosphate is a growing research area. However, the manufacturing and processability of MOFs for practical applications are often hindered by their cost and their powder form. This study pioneers the use of water-soluble organic ligands, specifically disodium terephthalate (DST) sourced from waste plastic, in the design and assembly of different MOFs such as Fe-MOF, Zr-MOF and Al-MOF in an aqueous medium. The Fe-MOF had a superior phosphate adsorption capacity (72.16 mg g^{-1}) which led us to process the Fe-MOF into PET composite chips to enhance its recovery and recycling processes. The effect of some parameters such as contact time, the initial concentration, pH, and temperature was investigated. This innovative approach showcases the potential of sustainable MOF materials in addressing phosphate removal challenges while promoting environmental awareness.

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