

Breakthrough Highly-Effective Extraction of Perfluorooctanoic Acid Using Natural Deep Eutectic Solvents

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Abstract : Addressing the growing challenge of per- and polyfluoroalkyl substances (PFAS) pollution in water bodies, this study introduces natural deep eutectic solvents (NADESs) as a pioneering solution for the efficient extraction of perfluorooctanoic acid (PFOA), one of the most persistent and concerning PFAS pollutants. Among the tested NADESs, trioctylphosphine oxide: lauric acid (TOPO:LauA) in a 1:1 molar ratio was distinguished as the most effective, achieving an extraction efficiency of approximately 99.52% at a solvent-to-feed (S:F) ratio of 1:2, room temperature, and neutral pH. This efficiency is achieved within a notably short mixing time of only one min, which is significantly less than the time required by conventional methods, underscoring the potential of TOPO:LauA for rapid and effective PFAS remediation. TOPO:LauA maintained consistent performance across various operational parameters, including a range of initial PFOA concentrations (0.1 ppm to 1000 ppm), temperatures (15 °C to 100 °C), pH values (3 to 9), and S:F ratios (2:3 to 1:7), demonstrating its versatility and robustness. Furthermore, its effectiveness was consistently high over seven consecutive extraction cycles, highlighting TOPO:LauA as a sustainable, environmentally friendly alternative to hazardous organic solvents, with promising applications for reliable, repeatable use in combating persistent water pollutants such as PFOA.

Keywords : deep eutectic solvents, natural deep eutectic solvents, perfluorooctanoic acid, water remediation

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