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Abstract

This study examines the high potential of melamine foams modified by ferric chloride for the efficient treatment of a broad variety of waters polluted by oil, including colloidal emulsions, oil-in-water mixtures, and free oil removal. The modification of melamine foams (MFs) by water solutions of some transition metal salts induces their (super)hydrophobic and (super)oleophilic character and makes them suitable to absorb a large amount of various organic liquids, whereas the sorption of water is significantly suppressed. This modification also enables the efficient treatment of various oil/water systems, including oil/water colloidal emulsions with oil droplet sizes on the order of hundreds of nanometers, oil in water mixtures up to 40 weight % of the oil component, and “free’ oil removal as it was demonstrated in this study for the first time. The emulsions containing 100 ppm diesel oil (DO) were separated with 91.4% efficiency, and the mixtures containing 20 and 40 weight % DO were separated with 99.9% efficiency. Modified foams also quickly removed free DO from the water surface, absorbing 95 g/g DO, whereas water sorption was negligible. A multiplied usage of these foams for all these niche operations was also proven.