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Hydrophobic Deep Eutectic Solvents: an efficient approach for water treatment

AUTHORS
Isabel MARRUCHO / INSTITUTO SUPERIOR TÉCNICO, AV ROVISCO PAIS 1, LISBON

PURPOSE OF THE ABSTRACT

One of the major problems of modern society is to be able to provide clean water to everyone, that is, to develop efficient wastewater treatment processes and simultaneously reduce the hazardousness of the current micropollutants present in different kinds of wastewater, such as those resukting fromdomestic, industrial and agricultural water activities [1]. The occurrence of micropollutants in aquatic ecosystems is a serious public health and environmental problem. Besides that, the wide diversity of micropollutants, with different chemical functionalities and structures, leads to a true challenge for the developmemnt of sustainable and cost effective wastewater treatment technologies. As a result, alternative techniques and materials for water purification processes have been considered. Recently, a class of new solvents, Deep Eutectic Solvents (DESs), have been emerging as an easy-to-prepare, inexpensive, environmentally-benign media having potential for many applications [2]. DESs have been gaining a lot of attention especially due to their complex hydrogen bonding networks which enables superior solvation properties and the capacity to fine tune these properties, as a consequence, enhancing extraction efficiencies and selectivities [3].

Inspired by this novel class of solvents, the aim of this work is to advantageously use hydrophobic DESs, as cheap extractants for the removal of micropollutants from water environments. In particular, DESs using natural components, such as menthol and fatty acids, and also quaternary ammonium salts with long alkyl chains as hydrogen bond acceptors and natural carboxylic acids and alcohols as hydrogen bond donors were prepared and characterized through the measurements of their thermophysical, water solubility and solid-liquid phase diagrams. Extraction efficiencies were maximized by by optimizing the experimental factors using a central composite design combined with a response surface methodology. Aiming at full sustainability, a circular process will be developed by recycling and re-using the DES, as well as recovering the micropollutants.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

Deep eutectic solvents | water treatment | micropollutants | DES-based materials

BIBLIOGRAPHY

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