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Bioinspired solvent-resistant nanofiltration membranes

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In the last decades, there has been a trend towards bio-inspired approaches for the formation of nanocoatings as well as to accomplish energy-intensive industrial separations in a more sustainable fashion. Organic solvent nanofiltration (OSN) is a pressure driven technology where the operation conditions are moderate and additional waste streams are minimized, making this a favorable energy efficient approach for challenging molecular separations such as purification of active pharmaceutical ingredients, production of specialty chemicals and in the petrochemical industry just to mention a few examples, where this technology can be currently applied. The overall performance of OSN membranes is determined by solute/solvent interactions with the membrane top layer. Therefore, the modification of the membrane surface becomes crucial to obtain high -performance OSN membranes, as well as exploring novel and green approaches to improve the separation properties of OSN membranes, without sacrificing their permeation properties. One alternative for the fabrication of the thin-films in OSN membranes proposed in this work is the use of bio-polyphenolic molecules. Among the many classes of phenolic biomolecules, plant phenols are capable of binding and cross-linking due to their strong interfacial activity. Here, the successful optimization of the interfacial polymerization reaction for the manufacture of OSN membranes is demonstrated by replacing the common toxic amines used for this method with natural occurring bio-polyphenols such as dopamine, tannic acid, morin hydrate and catechin. These bio-polyphenols can be found in mussels, date fruits, guava fruits and green tea respectively and they were used to form a selective thin film on top of a crosslinked polyacrylonitrile or a cellulose support. These membranes have shown an exceptional performance and resistance towards harsh solvent environments. Due to the incorporation of natural compounds for the manufacture, they provide a cost-effective alternative for industrial separations due to the ease of chemical modification and preparation, which is potentially easy to scale up at low cost taking advantage of the natural compounds for their manufacture.

Biography

Liliana Perez-Manriquez is pursuing her PhD at King Abdullah University of Science and Technology (KAUST); her main research focuses on the incorporation of natural compounds for the manufacture of solvent resistant nanofiltration membranes providing a cost-effective alternative for harsh industrial separations processes. These membranes are easy to reproduce making them potentially easy to scale up at low cost taking advantage of the natural compounds for their manufacture with applications in pharmaceutical, petrochemical, textile and biotechnological industries. Her research has been showcased in three international conferences so far as a speaker and she won a poster presentation award in the last euromembrane conference.

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