

## **Lyotropic Liquid Crystals as enzyme host for selective degradations in aqueous molecular separations.**

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In water remediation, biomimetic membranes are becoming popular due to their selectivity, dynamic stability, nontoxicity, and biocompatibility. Lyotropic liquid crystals (LLC) are self-organizing networks that can conform to an array of geometries with high pore densities. As such, LLCs are excellent membrane materials for water applications because they are water-insoluble and readily manipulated to conform to an array of morphologies that provide inherent water channels that are readily tunable in size. Thus, this work focuses on the design, fabrication, and characterization of LLC-modified osmosis applications. Taking advantage of LLC compartmentalization capabilities and incorporating non-transmembrane enzymes. The proposed strategy is to assess conformation transformations and how enzymatic reactions take place when Urease is incorporated in the LLC compartments in order to comprehend at a molecular scale the performance of the modified material and feasibility of harnessing ammonia and remediated water for energy production. Functionalized membranes presented satisfactory water flux and superior salt rejection compared to nonfunctionalized membranes. SupPACMoDS membranes are 83% more efficient at preventing salt back flux than the nonmodified version and can achieve ~90% small contaminant rejection.