Bulk and Interfacial Self-Assembly of Surfactants in Deep Eutectic Solvents

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Deep eutectic solvents (DES) are biocompatible molecular mixtures similar to ionic liquids with unique properties, including stabilisation of biomolecules, tunable viscosity and nanostructural organisation. DES are formed by hydrogen bonding between hydrogen bond donor and acceptor components, offer promising alternatives to volatile organic solvents in pharmaceutical and cosmetic formulations. [1,2] Understanding surfactant behaviour in these complex fluids is key to advancing their application. [3,4] This study investigates the bulk and interfacial self-assembly of two anionic surfactants – sodium lauroyl sarcosinate (SLS) and cocamidopropyl betaine (CAPB) in two DES systems – 1:2 choline chloride:glycerol (ChCl:Gly) and 1:1:1 choline chloride:glycerol:urea (ChCl:Gly:U). We present recent results from neutron reflectometry (NR) on INTER at ISIS, and small-angle neutron scattering (SANS) on LARMOR at ISIS, investigating the bulk and interfacial self-assembly of SLS and CAPB across a range of concentrations (below, at, or above the critical micelle concentration (CMC). The surface tension was determined using hanging drop tensiometry to determine the CMC. These results provide insight into the molecular drivers of surfactant assembly in DES and highlight differences in the interfacial architecture and efficiency of structurally distinct surfactants. This study lays the groundwork for rational design of DES-based emulsions and delivery systems where interfacial control is critical.

Keywords:
Deep eutectic solvents, surfactants, self-assembly, neutron scattering, interfacial adsorption

References:

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Acknowledgements:
Swedish Research Funding Agency – Vetenskapsrådet, Röntgen Ångström Cluster (2023-06351), and Bundesministerium für Forschung, Technologie und Raumfahrt (ErUM-Pro BMBF 05K24FKA)