DISSOLUTION OF SURFACTANT LAMELLAR PHASES

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Formulated products are an essential part of everyday life. They are available everyway we look from toothpaste to salad dressing and from motor oil to make up. These products seems different but they share common components like oil, water, particles and surfactants. Surfactants have some applications like stabilize emulsions and foams, adding lubricity to surfaces, including detergent properties besides other applications. Therefore, surfactant dissolution is important in formulated product preparation and in their applications.

The main goal of this study is to provide further insight into the surfactant dissolution process and to examine the effect of changing the degree of surfactant hydrophobicity on the dissolution process of surfactants. To achieve this goal dissipative particle dynamics (DPD) simulations are used. The initial surfactant system contained surfactant molecules in solvent at 80%, forming a lamellar phase. Each surfactant molecule was modelled as a chain of beads (AAABC) representing of a block of 3 C3HnF6–n groups (A beads) a block of two EO2 groups (B beads) and a SO3 - groups (C bead). The solvent particle is represented by a single sphere of (W) representing 4 molecules of water (H2O).

The initial lamellar phases produced under equilibrium simulations were placed next to a box of water beads. After relaxation, the lamellar phase was then allowed to dissolve into the water. Results showed that increasing the hydrophobicity of the surfactant made it more difficult for the water to penetrate into the lamellar phase. While increasing the hydrophilicity slightly increased the breakup time for the lamellar phase, when compared to the time of the lamellar phase breakup in the original system. Moreover, the dissolution of the surfactant with higher hydrophobicity produces micelles which are more elongated and worm-like in nature. In conclusion, surfactants with more hydrophobic tails take longer for the lamellar phase to break down and to dissolve fully into the box and hence effect their preparation and usage.

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