Molecular Dynamics Simulation of the Stability of Film Stabilized by Zwitterionic Surfactant and Anionic Surfactant

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Betaine as a foam booster has been shown to be able to increase the efficiency of surfactant foam enhanced oil recovery process. By mixing betaine with anionic surfactants, the stability of foam generated can be increased dramatically even in the presence of oil, which acts as a foam destruction agent. However, the mechanics behind the role of betaine as a foam booster is still unclear. Molecular dynamics simulations have been performed on air/water/surfactant interfaces and water/oil/surfactant interfaces to study the synergism between lauryl betaine (LB) and sodium alpha olefin sulfonate (AOS). To be specific, the microscopic structures of the surfactant monolayers formed with different LB to AOS ratio at an air/water interface and a water/oil interface have been investigated. Also, the umbrella sampling technique has been used to investigate the strength of interaction between surfactants in the surfactant monolayers with different LB to AOS ratio. The stability of film stabilized by surfactant monolayer with different LB to AOS ratio has been studied. It has been shown that highly structured monolayers can be formed from the mixture of LB and AOS, indicating synergism between surfactants. There exists an optimal LB to AOS ratio at which the strength of interaction between LB and AOS and the stability of films reach a maximum.