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ADSORPTION OF MIXED ANIONIC AND CATIONIC SURFACTANTS ON ALUMINA

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Recently, surfactant-based processes have been widely studied for using in environmental remediation. In all of these applications, surfactant adsorption into solid surface is of interest. When undesirable, surfactant adsorption can render a design ineffective and significantly increase dosage requirements and thus adversely affect the economics of the system. The purpose of this research is to maximize the surfactant adsorption onto alumina while minimizing the aqueous surfactant concentration using mixed anionic and cationic surfactant system. Maximum surfactant adsorption can be achieved because the mixed adsorption increase the adsolubilization capacity of organic solutes of the mixed adsorbed surfactant aggregates onto alumina. The specific objectives of this study are to investigated the adsorption of mixed anionic and cationic surfactants for the twin-head anionic surfactants, sodium hexadecyl diphenyloxide disulfate (SHDPDS), and the conventional cationic surfactants, dodecyl pyridinum chloride (DPC) with different molar fraction of cationic surfactants in the mixed surfactant system onto alumina; adsolubilization for organic solutes of polar nature, styrene, and non-polar nature, ethylcyclohexane, with the mixed surfactants admicelles; and the solubilization of the organic solutes into the mixed surfactant micelles. The results showed that the total adsorption of mixed anionic and cationic surfactants increased with increasing the cationic surfactant mole fraction in the mixed surfactant system. The adsorption of the mixed surfactant system showed a low synergism with only the cationic surfactant adsorption in the mixed system being enhanced but no significant different on the adsorbed anionic surfactants onto alumina. The highest maximum adsorption was obtained at 3:1 SHDPDS:DPC molar ratio corresponding to 0.30 mmole/g or 1.36 molecule/nm^2. The solubilization capacity of both styrene and ethylcyclohexane in the micelles increased with increasing cationic surfactant mole fraction in the mixed surfactant system. The cationic surfactant mole fraction in the mixed surfactant increased with decreasing adsolubilized styrene in the admicelles and increasing adsolubilized ethylcyclohexane at low ethylcyclohexane loading level. The admicellar partitioning coefficient (K_{adm}) of the organic solutes was of the same order as corresponding micellar partitioning coefficient (K_{mic}). These results provide the useful information for mixed anionic and cationic surfactant systems at the liquid-solid interface and for designing surface modification to enhance contaminant remediation.

Inter-Department Environment Management — Student's signature Ampira Charoensaeng

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