Synopsis of Original Research Paper

Condensed film formation of cationic surfactant at the oil-water interfaces and its application to emulsion stability

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In this study, we demonstrated that the adsorbed film of hexadecyltrimethylammonium bromide (CTAB) shows a novel first-order phase transition between expanded and condensed films at the oil-water interface by using interfacial tensiometry and ellipsometry. The analysis of obtained experimental data indicated that the penetration of alkane molecules into the CTAB adsorbed film realized the condensed film formation of cationic surfactant due to the enhancement of dispersion interaction of hydrophobic chains without increasing electric repulsion between hydrophilic groups. Furthermore, it was also revealed that the condensed film formation was accompanied with the strong preferential adsorption of longer chain alkanes if the oil phase was composed of the mixture of alkanes. We extended these findings to control the stability of the oil-in-water (O/W) emulsions and found that the volume of the O/W emulsion was reduced to about 1/4 at the temperature very close to the expanded-condensed phase transition point, indicating that the condensed film formation remarkably unstabilized the O/W emulsions.