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**Mixed Monolayer of Fluorinated and Hydrogenated Surfactants at the Water-Hexane Interface**

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The phase diagram (interfacial tension versus temperature) of mixed, fluorinated ( $\text{CF}_3(\text{CF}_2)_7(\text{CH}_2)_2\text{OH}$ ) and hydrogenated ( $\text{CH}_3(\text{CH}_2)_{19}\text{OH}$ ) surfactants at the water-hexane interface depends upon the total surfactant concentration ( $m$ ) and the relative concentration ( $X_2$ ) of fluorinated surfactants to the total surfactant concentration. When  $X_2 = 0.28$  a triple point is observed. When  $X_2 = 0.25$ , the phase diagram has only two phases. In this experiment, x-ray reflectivity has been used to probe molecular structure and ordering in these different phases and near the transitions between phases. Analysis of the three-phase system ( $X_2=0.280$ ;  $m=25\text{mmol/kg}$ ) indicated that at low temperatures the interface is fully covered by a monolayer of  $\text{CH}_3(\text{CH}_2)_{19}\text{OH}$  (denoted condensed hydrogenated or CH phase). At intermediate temperatures, the interface is fully covered by a monolayer of  $\text{CF}_3(\text{CF}_2)_7(\text{CH}_2)_2\text{OH}$  (denoted condensed fluorinated CF phase). The mixed surfactant system in the CF and CH phases have a similar structure to the low temperature phases of their corresponding single surfactant systems [1, 2]. At high temperatures a dilute monolayer phase (denoted D) covers the interface and consists of gaseous and condensed domains. At the CH to CF phase transition there is an abrupt increase in the interfacial coverage of CF phase domains complementing a similar decrease in the CH phase domains. Unlike the CH to CF phase transition, the CF to D phase transition is a gradual decline in the interfacial coverage of CF phase domains complimented by an increase in the coverage of gaseous domains.

In the two-phase systems ( $X_2=0.280$ ,  $m=12.5\text{mmol/kg}$  and  $X_2=0.250$ ,  $m=15\text{mmol/kg}$ ) at low temperatures the interface is in the CH phase, similar to the three phase system discussed above. Preliminary analysis of the high temperature data shows that the interface consists of both condensed surfactant phase domains – CF and CH, coexisting with gaseous domains. This is in contrast to the D phase of the three phase system that contained only CF and gaseous domains. However, the gradual decrease in the interface coverage of condensed surfactant domains as a function of increasing temperature into the D phase is similar for both two and three phase systems. Unexpectedly, CF phase domains are observed near the CH to D phase transition in both two-phase systems.

**References:**

1. A. M. Tikhonov, M. Li, M. L. Schlossman, J. Phys. Chem. B, 105, 8065 (2001).
2. A. M. Tikhonov, M. Li, M. L. Schlossman, in preparation.