Effect of perfume solubilization on viscosity behavior in aqeuous wormlike micellar solutions containing anionic-nonionic surfactant mixture

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Aqueous anionic-nonionic surfactant sytems are a typical washing detergent base system since foamability is boosted by wormlike micelles formed in such mixed surfactant systems. It is known that the viscosity behavior of wormlike micellar solution is highly dependent on oil solubilization and molecular structure of oil solubilized[1]. We studied effect of perfume solubilization on the viscosity behavior of aqueous wormlike micellar solution since it is important from viewpoint of washing detergent formulation containing normally several different perfumes.

The system employed forming wormlike micelles is the water/sodium dodecyl sulfate (SDS)/tri(oxyethylene) dodecyl ether ($C_{12}EO_3$) system in which a highly viscous wormlike micellar solution is formulated at a certain surfactant mixing fraction[2] as shown in Figs.1 and 2. As shown in Fig.1, adding several alcohol-type perfumes (decenol, geraniol and α-terpineol) changes maximum viscosity composition toward lower nonionic composition due to solubilization in the surfactant palisade layer in the micelles. The composition shift is the largest for the decenol and the least for the α-terpineol having 6-membered ring, indicating the degree of penetration in the palisade layer is influenced by molecular structure of perfumes. Molecular structure of nonalcohol-type perfumes also affects the viscosity behavior as shown in Fig.2. In this case, the composition giving high viscosity shifts lower by solubilizing limonene and *p*-cymene. Interestingly, solubilization of decane extensively lowers the viscosity due to solubilizing in the core of the micelle whereas nonpolar molecule with a cyclic structure, hexahydrocumene seems highly penetrative in the palisade layer.

1) C. Rodriguez-Abreu, et al., J. Colloid Interface Sci., 291, 560 (2005)

2) D. P. Acharya, et al., J. Phys. Chem. B, 110, 754 (2006)

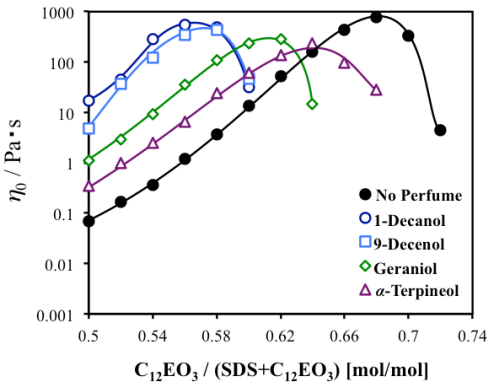

Fig.1 Variation of zero-shear viscosity (η_0) in water/SDS/$C_{12}EO_3$/high-polarity perfume systems at 25°C.

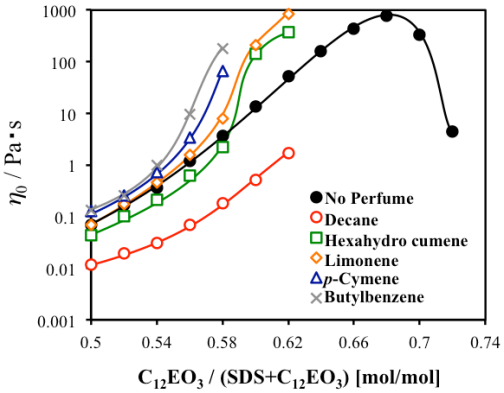

Fig.2 Variation of zero-shear viscosity (η_0) in water/SDS/$C_{12}EO_3$/low-polarity perfume systems at 25°C.