

15. Physico-chemical Properties of Surface Active Agents. (VII)

On the Concentration for Micelle Formation in Aqueous Polyoxyethylene Glycol Mono-Alkyl Ether Solution

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In the previous work (this Bulletin 26 82 (1951)), the concentration for micelle formation in the aqueous solution of polyoxyethylene glycol mono-alkyl ether (PEGAE) was measured by various methods. However, the detail of the micelle formation of this detergent was not clear.

In the present work, the density of the aqueous solution of PEGAE was measured again at 25°C. And further, the partial specific volume of the solute was calculated to make clear the behavior of the molecule of PEGAE.

At low concentration of the detergent, the density of the solution was almost independent of the concentration. Above a certain concentration (termed C_0), it showed steep increase. And this concentration C_0 almost agreed with the one reported previously. The values of C_0 in PC 13, PC 18 and PL 6 were 2.0, 2.8 and 8.0×10^{-3} mol/litre, respectively.

The partial specific volume of the solute, calculated from this density, began to increase with the concentration at extremely low concentration of the detergent, while it became independent of the concentration above C_0 .

As seen in the case of Aerosol MA reported by R. J. Vetter (J. phys. & Coll. Chem. 51, 262 (1947)), this increase of the partial specific volume may be due to the micelle formation. Hence, the micelle formation may occur even at extremely low concentration of the detergent, as suggested in the previous report VI.

And probably, the concentration of the unassociated molecules decreases gradually until the concentration reaches to the C_0 , of the sample. Thus it was found that the concentration range for micelle formation is fairly broad in this case, while ionic detergents have a narrow concentration range for micelle formation. And the C_0 may correspond to the upper limit of this range.