Fluorometric determination of the 2nd critical micelle concentration of sodium dodecyl sulfate

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The determination of the critical micelle concentration (CMC) of various surfactants has been intensively investigated by several different techniques, *i.e.* electric conductivity, light scattering, surface tension and viscosity methods.

Nonetheless, most of these techniques are only concerned with the determination of the lst CMC of them[1,2]. Those methods are usually failed to obtain a clear 2nd CMC, most probably, due low sensitivity to detect.

Spectro-fluorometric method with fluorescence probe anilino-naphthalene sulfonate (ANS) has been employed to determine the lst CMC of sodium dodecyl sulfate (SDS)[3].

Since the fluorescence parameters such as quantum yield, polarization and lifetime are very sensitive to the microenvironmental changes of the fluorophores, the change of those properties of fluorescence probe has been frequently employed to study the hydrophobic interactions in protein and membrane biology.

A drastic enhancement of fluorescence quantum yield, when the probes (ANS and Pyrene) interact with the hydrophobic interior of the micelle, makes us attempt to determine the 2nd CMC of SDS with this method. The representative physical property changing at its 2nd CMC is known to be the shape of micelle. Consequently, a certain microenvironmental change can be expected to occur and there must be a change of the fluorescence properties.

In this communication, we present the results on the determination of the 2nd CMC of SDS by the fluorometric method using ANS and pyrenes an extrinsic fluorescence probe.

Fluorescence intensities monitored by the Aminco-Bowman spectro-fluorometer are corrected through the normalization with the PM tube response-curve presented at the manual. Optical density correction is also performed by multiplying the factor $(1-10^{-O.D})$ to each fluorescence.

Figure 1 shows the plot of fluorescence intensities of ANS at its concentration of 3.2×10^{-4} *M vs.* SDS concentrations.

Two distinct breaking points at 8 m*M* and 70 m*M* concentration of SDS are demonstrated. These two values coincide well with the lst and 2nd CMC of SDS determined with other method[5].

Pyrene, which has fairly long fluorescence lifetime, is used as an another probe. Pyrene-SDS solution has been prepared to be [pyrene]/[SDS]=1/100 and solubilize it completely

by boiling[6].

Fluorescence measurements are carried out after 2 days of equilibrium at 25°C.

This compound forms a face-to-face excimer[7] and gives excimer emission (F_2) at 470 nm and monomer emission (F_1) at 390 nm.

In this experiment, we plotted the value of F_2/F_1 as a function of SDS coneentration and also found a sharp break at 70 mM of SDS in good agreement with the one determined by using ANS (Figure 2).

註) Bull. Kor. Chem. Soc. 1, 1, 29, 1980에 게재된 내용임.

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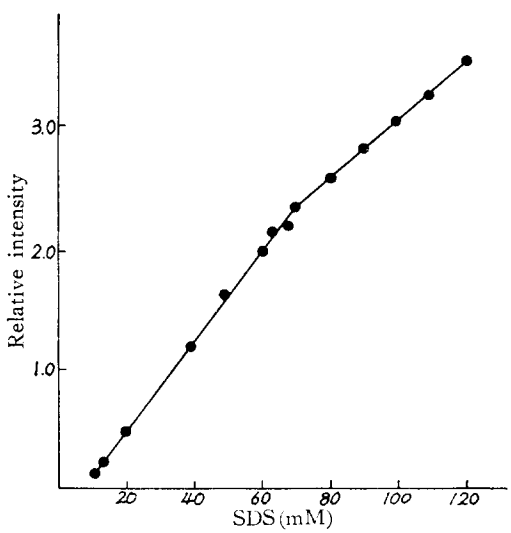

Fig. 1, Relative fluorescence intensities of ANS (3.2×10^{-4}M) are plotted as a function of SDS concentration. Fluorescence emission spectra were monitered exciting at 425nm.

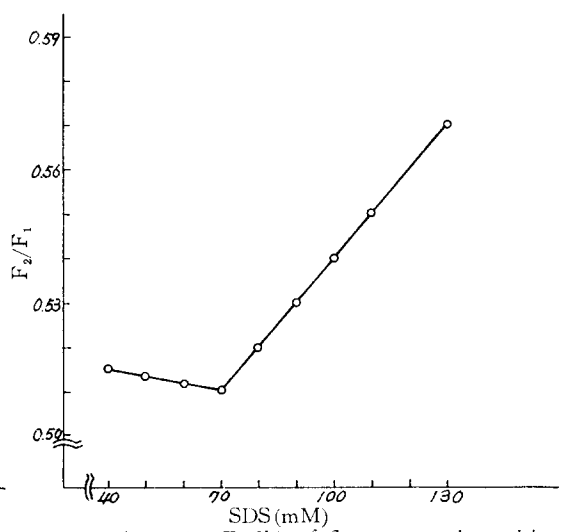

Fig. 2, The ratios (F_2/F_1) of fluorescence intensities of excimer (F_2) and monomer (F_1) are plotted as a function of SDS concetration. Fluorescence emission spectra were monitered exciting at 360nm.