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Author	横山, 祥子(Yokoyama, Shoko) 金子, 明子(Kaneko, Akiko) 藤江, 忠雄(Fujie, Tadao)
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Surface Potential of Mixed Micelles Composed of Prostaglandin B_2 and Heptaethylene Glycol Dodecyl Ether by the Fluorescence Method*

Shoko YOKOYAMA, Akiko KANEKO, and Tadao FUJIE

横山祥子，金子明子，藤江忠雄

The surface state of negatively charged mixed micelles prepared by addition of prostaglandin B_2 (PGB_2) to nonionic heptaethylene glycol dodecyl ether (HED) has been investigated and the surface potential ($\Delta\psi$) of the micelles has been estimated by measuring the fluorescence intensity of ammonium 8-anilino-1-naphthalenesulfonate (ANS) as a fluorescent probe. Since the binding constant of ANS, k, is dependent on the surface potential of the micelle, the value of $\Delta\psi$ was determined according to the equation $\Delta\psi = -59.16 \log (k_0/k)$ at 25℃, where k_0 is the k of HED micelle. The value of $|-\Delta\psi|$ increases with increasing mole fraction of PGB_2 (X_{PGB_2}) and decreases with increasing ionic strength (J). These changes are due to the effects of the negative charge of PGB_2 and of ionic atmosphere of Na^+, respectively. Surface charge density (σ) was, therefore, determined from $\Delta\psi$ according to the Gouy-Chapman theory, with a result that σ is nearly independent of J and proportional to X_{PGB_2}. These results have led to a conclusion that the state of the diffuse layer surrounding the Stern layer on the micelle surface is represented well by the Gouy-Chapman theory as well as a previous result for the system of sodium dodecyl sulfate (SDS) and HED. The value of $|-\sigma|$ for PGB_2 micelle is less than that for SDS micelle, which suggests that PGB_2 forms a loosely packed micelle.

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