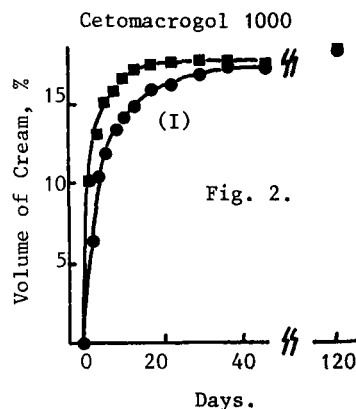
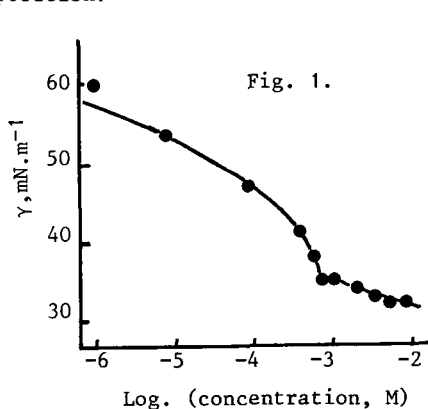


SOME PHYSICO-CHEMICAL PROPERTIES OF A POLYOXYBUTYLENE -
POLYOXYETHYLENE SURFACTANT

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Patel et al (1981) concluded that a hydrophobe more polar than an alkane was necessary to improve the solubilising capacity of nonionic surfactants. To test this the structure $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_2\text{O}(\text{CH}_2\text{CH}(\text{C}_2\text{H}_5)\text{O})_5(\text{CH}_2\text{CH}_2\text{O})_{19}\text{H}$ (I), was synthesised by reaction of 2-ethoxyethanol with butylene oxide, the product fractionally distilled (b.p. 170-206°/0.2mm), and reacted with ethylene oxide. After purification (I) had the expected spectral characteristics and elemental composition.



Surface tensions in water, γ , (Fig.1) were determined by the Wilhelmy Plate method. The CMC ($7.8 \times 10^{-4}\text{M}$) was much higher than that of polyoxyethylene (21) monohexadecylether, $\text{C}_{16}\text{E}_{21}$, which had a CMC of $3.9 \times 10^{-6}\text{M}$ (Elworthy & Macfarlane 1962), reflecting the polarity of the hydrophobe. The area/molecule decreased from 1.6nm^2 at $\gamma = 52\text{mN.m}^{-1}$ to 0.38nm^2 at the CMC where $\gamma = 36\text{mN.m}^{-1}$, which was lower than the value found at the CMC for $\text{C}_{16}\text{E}_{21}$ (1.20nm^2), and may indicate that the oxyethylene chain is more elongated in (I) than in $\text{C}_{16}\text{E}_{21}$. From the surface area - surface pressure curve, the interfacial film was liquid expanded in type. Compared at their CMCs, the surface tension of (I) was 9mN.m^{-1} lower than that of $\text{C}_{16}\text{E}_{21}$. Micellar solubilisation was only about 3% of that of $\text{C}_{16}\text{E}_{20}$ (Arnarson & Elworthy 1980), probably due to a smaller micellar size.

As compounds with good surface activity and poor solubilising capacity would be useful in emulsion formulations to avoid the inactivation of preservatives, a preliminary test was made of the effectiveness of (I) as an emulsifier compared to cetomacrogol 1000. 10% w/w liquid paraffin in water was emulsified using 1% of surfactant. The creaming rate when (I) was present was lower than that of cetomacrogol (Fig.2), and after 4 months storage at room temperature there was no visible evidence of oil separation.

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