These high values of the viscosity η and the energy of activation $\Delta E^{\ddagger}$ were considered to be due to the large hydrodynamic unit in viscous flow and the interaction between molecules.

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21. Physico-chemical Properties of Surface Active Agents. (III) On the Critical Micelle Concentration in Aqueous Polyoxyothylene Glycol Alkyl Ether Solution

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Recently many reports concerning the properties of aqueous ionic detergent solution have been published. And it has been well known that the molecules of the detergent associate into micelles in the aqueous solution above a certain critical concentration, i.e., c.m.c.,

However, the properties of the aqueous solution of the non-ionic detergent has not completely been investigated.

In the present work, the c.m.c. in the aqueous solution of polyoxyethylene glycol alkyl ether was examined by the following four different methods, i.e., viscosity, density, absorption spectrum, and electrical conductivity method. And the last two methods were carried out in the following procedure.

1) Absorption spectrum of aqueous pinacyanol chloride solution (1.4×10^{-5}mol/l) was measured in the presence of the detergent at room temperature (about 15°C) and it was found that the intensity of the absorption band maximum in 610$m\mu$, increased greatly with addition of the detergent, though this band maximum shifted about 10$m\mu$ towards longer wave length than in water. The concentration at which the most rapid increase of this band maximum occured was taken into concideration in this case.

Method	Temperature	The c.m.c. in aqueous PEAGE solution Mol/Litre$\times10^3$						
		PO-8	PO-20	PC-10	PC-13	PC-18	PL-6	PL-20
Viscosity	31°C	—	—	7.6	2.6	5.3	—	—
Density	31°C	3.8	5.6	7.1	6.4	2.5	6.7	3.3
Absorption Spectrum	ca. 15°C	—	—	—	0.9~3.7	—	—	—
Electrical Conductivity	18°C	—	—	—	5.6	3.9	—	—

The same symbols of the detergemt as in the previous reports are used in this table.

2) The electrical conductivity of the detergent solution was measured at 18° C. by adding KCl. And it was observed that the conductivity value of this solution agreed with that of KCl solution at a low concentration of the detergent, but above a certain concentration the conductivity value was smaller than that of KCl solution. The concentration in question in this case was one at which the deviation was first observed.

The results obtained by these methods were summerized in the following table.

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22. Physico-chemical Properties of Serface Active Agents. (IV) Dielectric Properties of Polyoxyethylene Glycol mono-Alkyl Ethers

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As the PEGAE is a non-ionic surface active agent and its hydrophilic property is due to a large polar group, i.e. the chain of polyethylene oxide, it is desirable to examine the dielectric properties of the PEGAE. So in the present work the dielectric constant ϵ' and loss ϵ'' for each sample were measured with the susceptance variation method over the frequency range 3–30 Mc. and at a range of temperatures from 35° to 65°C. The observed values of ϵ' were given in the following table.

	Temp. (°C)	Sample / Freq. (Mc)	PO-8	PO-20	PC-10	PC-13	PC-18	PL-6	PL-20
ϵ'	40	3	6.00	7.77	6.70	6.81	6.39	7.31	7.81
		10	5.87	7.40	6.45	6.48	6.41	6.93	7.29
		30	5.46	6.53	5.90	5.83	6.04	5.89	6.79
	65	3	5.67	7.31	6.31	6.26	6.12	6.78	7.29
		10	5.49	7.02	6.00	6.09	5.91	6.52	7.04
		30	5.19	6.27	5.60	5.50	5.55	5.61	6.38

As shown in the table, the interesting features were found in values of ϵ'; the more the number of carbon atom in the alkyl group, the lower the value of ϵ' for the PEGAE with a given chain length of ethylene oxide, and the longer the polyethylene oxide chain, the higher the value of ϵ' for samples with a definite alkyl group.