TABLE 1 — VARIATION OF FLUORESCENCE INTENSITY WITH THE CONCENTRATION OF SURFACTANTS IN 20% ETHANOL

[λ_{ex} = 365 nm; λ_{em} = 400 nm; FI = fluorescence intensity]

% DBSS	FI	% DSSS	FI	% T_x-100	FI	% Brij-35	FI	% Tween-80	FI	% CTAB	FI
0·00	4	0·00	4	0·000	4	0·000	4	0·000	4	0·00	4
0·05	7	0·05	3	0·005	6	0·005	3	0·001	7	0·01	4
0·08	16	0·10	6	0·010	7	0·010	5	0·002	13	0·02	5
0·10	26	0·20	14	0·020	14	0·020	14	0·003	18	0·03	7
0·15	45	0·25	20	0·030	34	0·025	19	0·004	24	0·04	14
0·20	62	0·30	26	0·035	47	0·030	29	0·005	30	0·05	25
0·25	70	0·35	32	0·040	55	0·035	26	0·006	37	0·06	39
0·30	74	0·40	38	0·045	62	0·040	21	0·008	46	0·07	56
0·35	77	0·50	46	0·050	67	0·045	32	0·010	53	0·08	64
0·40	78	0·60	53	0·060	76	0·050	54	0·014	62	0·09	66
0·50	78	0·70	61	0·080	84	0·060	74	0·018	67	0·10	69
0·60	79	0·80	63	0·100	86	0·080	77	0·050	73	0·12	73
—	—	—	—	0·200	88	0·100	79	0·100	78	0·14	74
—	—	—	—	0·300	88	0·200	79	0·150	80	0·16	75

TABLE 2 — VARIATION OF FLUORESCENCE INTENSITY WITH CHANGING ETHANOL CONCENTRATION

[9,10-DPA = $10^{-5}M$; λ_{ex} = 365 nm; λ_{em} = 400 nm]

% ethanol	Fluorescence intensity	% ethanol	Fluorescence intensity
10	3	60	120
20	4	70	116
30	14	80	112
40	85	90	106
50	124	100	100

measuring fluorescence intensity, at different wavelengths. The emission spectra were taken on Aminco-Bowman spectrofluorimeter.

After examining the fluorescence excitation spectrum, 365 nm was chosen as the excitation wavelength. The fluorescence emission was measured at 400 nm.

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Micellization of Cobalt Hexammine Soaps in Methanol-Benzene Mixture

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Cobalt hexammine laurate, myristate, palmitate and stearate have been prepared and their micellization in methanol-benzene mixtures has been studied by conductance and absorbance methods. The c.m.c. values determined by the two methods are in good agreement. It is found that the c.m.c. values of soaps increase from stearate to laurate in methanol-benzene mixtures. The c.m.c. values of the soaps decrease with the decreasing amount of methanol in the mixture.

HEAVY metal ions like Cu(II), Co(II) and Ni(II) etc. interact with sodium salts of higher fatty acids to give heavy metal soaps which form micelles[1] in non-aqueous medium and are used as catalysts, additives in lubricating preparations etc. These metal soaps are sparingly soluble in non-aqueous media. It was thought worthwhile to prepare modified metal soaps such as cobalt hexammine soap which may have higher solubility in non-aqueous media. The higher solubility might significantly affect the role of metal soaps in lubricating preparations. These modified soaps have been designated as metal complex soaps. No data are available on the solubility and micellar behaviour of these soaps in solution. It is observed that the cobalt complex soap is relatively more soluble than the corresponding cobalt soap.

Sodium laurate, myristate, palmitate and stearate were of reagent grade (BDH) and were used as such. All other reagents and solvents were of AR grade. Hexammine cobalt(III) chloride was prepared by the literature method[2]. Cobalt myristate was also prepared by the literature method[3].

Preparation of cobalt hexammine soaps — The cobalt hexammine laurate, myristate, palmitate and stearate were prepared by interacting aqueous solution (0·01M) of respective sodium soaps with aqueous

TABLE 1 — ANALYTICAL DATA ON THE COBALT HEXAMMINE SOAPS

Soap	N (%)*	
	Calc.	Found
Cobalt hexammine laurate, $Co(NH_3)_6(C_{11}H_{23}COO)_3$	11·09	10·68
Cobalt hexammine myristate, $Co(NH_3)_6(C_{13}H_{27}COO)_3$	9·98	9·55
Cobalt hexammine palmitate, $Co(NH_3)_6(C_{15}H_{31}COO)_3$	9·13	[illegible]·34
Cobalt hexammine stearate, $Co(NH_3)_6(C_{17}H_{35}COO)_3$	8·32	8·59

*Satisfactory C, H analyses have been obtained for all the soaps.

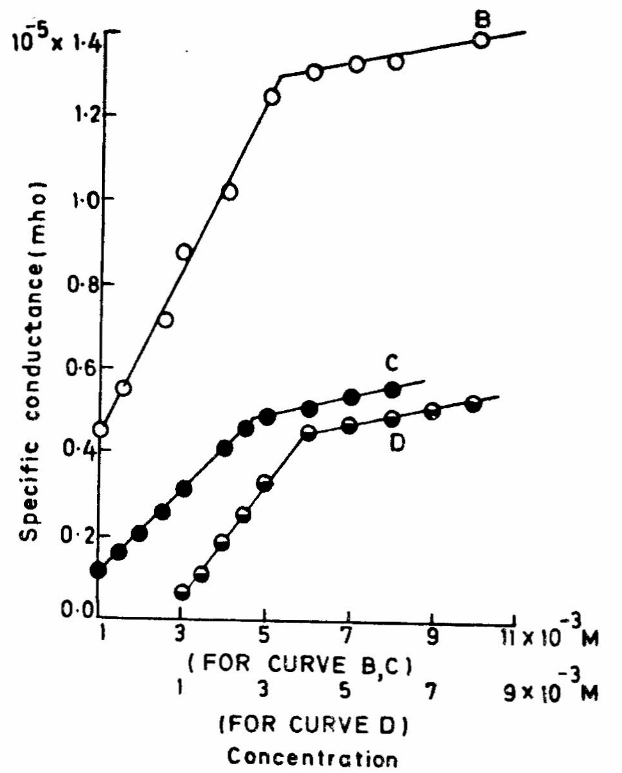

Fig. 1 — Plots of specific conductance versus concentration of cobalt hexammine laurate solution in methanol-benzene mixtures of varying compositions [B = 80%, C = 60%, D = 40% methanol in benzene]

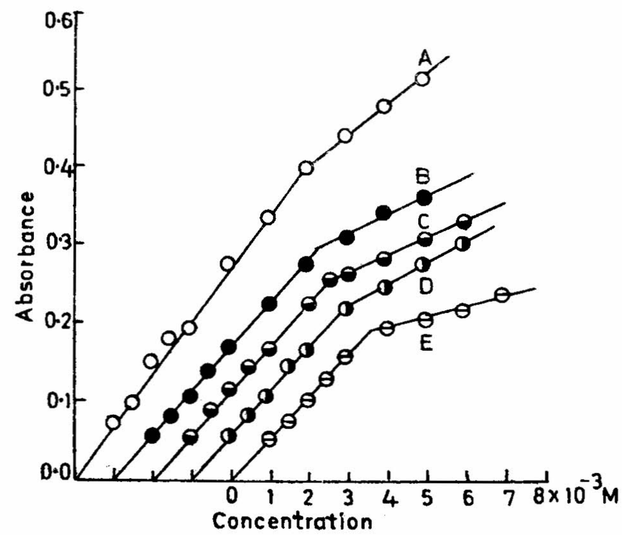

Fig. 2 — Plots of absorbance versus concentration of cobalt hexammine laurate solution in methanol-benzene mixtures [A = 100%, B = 80%, C = 60%, D = 40%, E = 20% methanol in benzene]

solution (0·02*M*) of hexammine cobalt(III) chloride. The precipitated cobalt hexammine soaps were filtered and washed with doubly distilled water and then with ethanol and were dried in a vacuum desiccator. The analytical data on the soaps are given in Table 1.

Table 2 — c.m.c. Values of Cobalt Hexammine Soaps and of Cobalt Myristate in Methanol-Benzene Mixtures at 30° ± 1°C

Methanol % (v/v)	c.m.c. ($\times 10^{-3}$ mole litre^{-1})				
	Cobalt hexammine stearate*	Cobalt hexammine palmitate*	Cobalt hexammine myristate*	Cobalt hexammine laurate*	Cobalt myristate
	Conductivity method*				
100	2·9 (3·0)	4·2 (4·4)	5·2 (5·3)	5·9 (6·0)	0·14
80	2·4 (2·6)	3·8 (4·0)	4·4 (4·5)	5·3 (5·3)	0·19
60	2·2 2·3)	3·1 (3·3)	3·4 (3·6)	4·6 (4·7)	1·4
40	1·5 (1·6)	2·4 (2·5)	2·8 (3·0)	4·0 (4·0)	1·6
20	1·0 (·0)	2·1 (2·0)	2·4 (2·5)	3·5 (3·6)	2·4

*Values in parentheses have been obtained by the absorbance method.

The plots between the specific conductance of cobalt hexammine laurate solution in methanol-benzene mixtures of varying compositions and its concentration and the plot of absorbance (at 470 nm) against concentration were drawn (Figs. 1 and 2). These plots exhibit breaks which is an indication of the onset of micellization. The c.m.c. values calculated from the inflections are given in Table 2. Similar plots were also obtained for cobalt hexammine myristate, palmitate and stearate and their c.m.c. values so determined are also given in Table 2. The c.m.c. values determined by both the methods are in close agreement. It is evident that c.m.c. value increases from stearate to laurate, indicating occurrence of polar groups of the soap molecule on the exterior of micelles. Further, the c.m.c. values of the soaps decrease with a decrease in the methanol content of methanol-benzene mixture. The decrease is due to the decrease in dielectric constant of the mixture resulting in less favourable interaction between the polar groups and solvent and, therefore, micellization occurring at relatively lower concentrations. The c.m.c. values of cobalt hexammine myristate are higher as compared to those of cobalt myristate.

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