Haematoxylin as a Colloidal Electrolyte in Aqueous Solution

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With 2 Figures

Abstract

The nature of Haematoxylin as a colloidal electrolyte in aqueous solution has been determined by the electrical conductance studies. The curve between the square root of concentration and molar conductance is not linear and resemble that of a colloidal electrolyte. The temperature of zero conductance has also been determined to be −21.5 °C. The temperature coefficient per degree centigrade per hundred of the conductance at 35 °C ranges between 0.86 and 1.61.

In connection with the previous studies on metal chelates involving organic dyes, it has been reported that physicochemical measurements on the composition of the metal chelates often show deviations from true stoichiometry when the solutions employed for the investigations are not very dilute. Dey et al[1–3]) reported that this deviation is due to the behaviour of the ligand as colloidal electrolyte. They recommended that physicochemical measurements in such cases should be carried out with very dilute solutions. This communication reports experiments to show the behaviour of Haematoxylin which give coloured chelates with eare earth as a colloidal electrolyte.

Results and Discussion

The electrical conductance of solutions of Haematoxylin was determined at various dilutions at a temperature of 25°, using a Leeds and Northrup Kohlrausch Slidewire with an audiofrequency oscillator in the circuit and a dip type measuring cell having a cell constant of 0.5875. A graph was plotted between the square root of concentration and molar conductance (Fig. 1) and this graph was

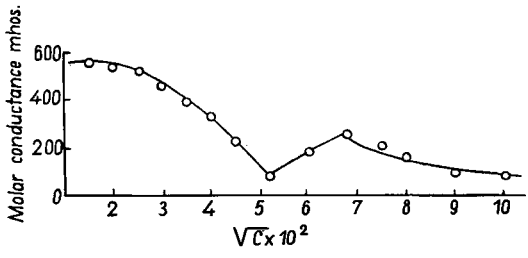

Fig. 1. Variation of Molar conductance with square root of concentration

[1]) A. K. Mukherji and A. K. Dey, J. Colloid Sci. **13**, 99 (1958).

[2]) A. K. Mukherji and A. K. Dey, Kolloid.-Z. **158**, 147 (1958).

[3]) S. P. Sangal and A. K. Dey, Jour. Sci. Industr. Research **21 B**, 660 (1962).

found to resemble that of the colloidal electrolytes as reported by McBAIN[4]), i. e., it is not linear. A graph was also plotted between the specific conductance of the reagent and temperature (Fig. 2) and from this the temperature of zero conductance was extrapolated and was found to be −21.5°, and the temperature coefficient per degree centigrade per hundred of the conductance at 35 °C was also calculated from Fig. 2, the results of which are recorded in table 1.

The results of table 1 shows that the temperature coefficient per degree centigrade per hundred of the conductance at 35° lies between 0.86 and 1.61. In the case of true electrolytes the temperature of zero conductance usually lies at −40° and the temperature coefficient per degree centigrade per hundred of the conductance at 35° in colloidal systems and colloidal electrolytes is mostly found to be below 2.0.

Thus on the basis of the above observations it is concluded that Haematoxylin behaves as a colloidal electrolyte on concentrated solutions, therefore, it is advisable to use very dilute solutions for physicochemical measurements.

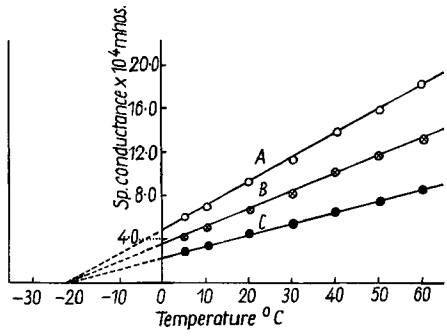

Fig. 2. Variation of specific conductance of Haematoxylin with temperature. Curve A Concentration of Haematoxylin 0.010 M; Curve B Concentration of Haematoxylin 0.0067 M; Curve C Concentration of Haematoxylin 0.0050 M

Table 1
Temperature Coefficient

Concentration M	Sp. Cond. at 35 °C (from graph) mhos · 10^4	Temp. Coeff. per degree centigrade	Temp. Coeff. per 100 of the conductance
0.0100	5.75	0.050	0.86
0.0067	9.10	0.100	1.09
0.0050	12.40	0.200	1.61

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[4]) J. W. McBAIN, Colloid Science, C. D. Heath and Co., Boston, Massachusetts (1950).

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