

Effect of Ageing on Coagulation Constants of Ferric Hydroxide Sol

By MUKHTAR SINGH and OM PRAKASH BANSAL

Abstract

During slow coagulation of Ferric Hydroxide sol with NaCl and KCl, the ageing effect on the constants a , m , and n of BHATTACHARYA'S equation,

$$1/c - a = \frac{n}{m} \cdot t + 1/m$$

has been studied. A decrease in the values of a , m and n has been found on ageing of the sol.

Introduction

Several workers have studied slow coagulation of sols in detail. BHATTACHARYA et al.¹⁾ have proposed a relation between concentration of electrolyte and the corresponding time of coagulation by an equation: $1/c - a = \frac{n}{m} \cdot t + 1/m$, where a , m and n are constants. The theoretical justification of this equation has been put forward by GHOSH and GANGOPADHYAY²⁾. YADAVA and VERMA³⁾ have studied the temperature effect on the constants a , m and n and have found that the rise in temperature causes a decrease in the values of these constants. The constants a , m and n depend on the stability of the sol and as the stability changes on ageing, these constants obviously will no longer have the same value. Thus an attempt has been made in this paper to study the effect of ageing on the above constants for dialysed ferric hydroxide sol using NaCl and KCl as coagulating electrolytes.

Experimental

Time of coagulation of the dialysed ferric hydroxide sol was determined by Light Extinction Method, using a photoelectric colorimeter and the constants a , m and n were

¹⁾ A. K. BHATTACHARYA et al., J. Indian chem. Soc. **28**, 179 (1951); J. Colloid Sci. **10**, 551 (1955).

²⁾ B. N. GHOSH and A. K. GANGOPADHYAY, J. Indian chem. Soc. **36**, 811 (1959).

³⁾ B. P. YADAVA and R. K. VERMA, J. Indian chem. Soc. **39**, 325 (1962).

found graphically⁴). The values of the constants obtained for the same stage of coagulation given by the same extinction value for the sol at different periods of ageing are tabulated below.

Observations

Table 1
Concentration of the ferric hydroxide sol = 15.76 gm. Fe₂O₃/litre

Coagulating Electrolyte	Period of ageing days.	Stage of coagulation (Extinction of light)	a m. moles	m m. moles	n (min. ⁻¹)
NaCl	7	60	60.0	108.1	90.78
	21	60	25.0	50.0	70.82
	35	60	20.0	32.26	6.442
KCl	7	60	60.0	111.10	99.26
	21	60	17.50	66.66	67.71
	35	60	15.00	38.46	38.46

Discussion

The above table shows that during the study of slow coagulation of ferric hydroxide sol., a decrease in the values of the constants a, m and n has been found to take place with the ageing of the sol. The values of "a", the critical stability concentration and of "m", the concentration of the electrolyte above the critical values to cause instantaneous coagulation, have been found to decrease rapidly in the initial period of ageing (7th to 21 days), but on further ageing (21 to 35 days) the fall becomes gradual. The decrease in the value of "a" shows that the value of maximum concentration causing no coagulation is reached at lower concentration on ageing the sol. From the decrease in the values of "m" it can be easily inferred that a much smaller quantity of electrolyte is required on ageing to cause instantaneous coagulation. Similarly, the decrease in the values of "n" indicates greater degree of aggregation of ageing.

According to FREUNDLICH⁵) only those colloidal particles are coagulated, kinetic energy of which is greater than the critical value. Hence it is thus obvious that the ageing of the sol would certainly increase the kinetic energy of the particles which would result the coagulation of the sol at a low concentration of coagulating ions. Consequently the the values of the constants a, m and n BHATTACHARYA's equation will also decrease.

⁴) A. K. BHATTACHARYA et al., Agra University Journal of Research Science **12**, 101 (1963); J. Colloid Sci. **11**, 124 (1956).

⁵) H. FREUNDLICH, Kolloid-Z. **23**, 163 (1918).

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Agra (India), Chemical Laboratories, Agra College.

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