The Asian Journal of Experimental Chemistry, Vol. 4 No. 1&2 (June & December, 2009) : 57-63

Research Paper :

Density measurement of alkali and alkaline earth metal myristates in non-aqueous medium (30^0–50^0C)

ANIL KUMAR, DEEPIKA SHUKLA AND DEEPTI TYAGI

Accepted : ***June, 2009***

See end of the article for authors' affiliations

Correspondence to:

ANIL KUMAR
Department of Chemistry,
D.A.V. (P.G.) College,
MUZAFFARNAGAR (U.P.)
INDIA

ABSTRACT

The present investigation deals with density measurement of alkali (Li, Na, K) and alkaline earth metal (Mg, Ca, Sr, Ba) myristates in 50% methanol-50% chloroform (V/V) solvent-mixture at 30°–50°C. The data have been used to determine critical micelle concentration, cmc, and compute other significant parameters *viz.* apparent (ϕ_v) and partial (φ^0_v) molar volumes and partial molar expansibility, $E°_{surfactant}$. The decreasing cmc with the increase in temperature is in agreement with the result obtained from specific conductance measurements. The variation of cmc with alkali and alkaline earth metals also follows the same order as was found in the study on conductance measurements.

Key words : Critical micelle concentration (c.m.c.), Density, Molar volume and expansibility

Data on molar volume have proved to be a useful tool to study the solute-solvent interactions (Bahadur, 1974).The apparent molar volume of glycine for inorganic salt solution of different concentrations was found to increase linearly with increasing concentration of the ions (Bhargava, 1976). Density data for aqueous solutions of 4-amino butyric acids at 25°C are also found to vary linearly with molarity (Blockhra and Verma, 1977). The apparent molar volume of ammonium acetate solutions was also determined from density data using Young's rule (Blokhra and Thakur, 1981). Dielectric constant of the medium was used to characterize tetraalkylamm-onium iodides in ethanol-water mixtures (Franks and Ives 1966). Dielectric constant however was found to play a dominating role in controlling the nature of the slope, Sv. Reference ('Franks and Luickenden, 1968; Franks *et al*., 1968; Hepler, 1969; Jalicoeur and Philip, 1975; Kashimato *et al*., 2006 and Key and Evans, 1966) on solute- solvent interactions indicate that density measurements proved useful to detect and explain the process of micellization. The density measurements were employed to study the micellar behaviour of the calcium soaps in water, methanol and water-methanol mixtures (Kim *et al.*, 2006). Density data was also used to determine the c.m.c. of copper (Lafitte, 2005), iron (mason, 1947 and Mehrotra *et al*., 1970) and cobalt (Millero, 1968) soaps of lower fatty acids in non-aqueous medium.

Apparent molar volume and limiting apparent molar volumes for electrolytes (Milero, 1970) and non-electrolytes (Millero, 1971) have found application to characterize solute-solute , solute-solvent and solvent – solvent interactions taking place in solutions. Hepler (Ram Gopal and Siddiqi, 1968) and Jolicoeur *et al*. (Ram Gopal *et al*., 1970) have however studied the effect of temperature on partial molar volume of hydrophopic solutes so as to obtain significant informations on solute-solvent interactions. Recently, however, research workers (Ram Gopal *et al*., 1973, Ram Gopal and Pathak, 1978 and root, 1933) have shown a keen interest for surface charge density of various amphipathetic substances. Kim *et al*., in the year, 2006 have thus carried out an investigation on polymerized rod like nanoparticles with controlled surface charge density. G. Lafitte and Co-Workers have utilized mixtures of mucin and oppositvely charged surfactant aggregates with varying charged density to probe their phase behaviour, association, and dynamics. Kashimoto *et al.* (Root, 1933) have also probed the surface density of surface-active substances through total reflection x-rays absorption fine structure measurement.

Present investigation however incorporates work in partial molar volume and expansibility so as to obtain useful information on micellization and solution behaviour *i.e.* solute-solvent and solute-solute interactions. Increasing surfactant concentration and increasing temperature increases the apparent molar volume which is consistent with the general expectation. Partial molar expansiblity (E^0_{surf}) for these surfactant systems are also found to increase with increasing temperature.

MATERIALS AND METHODS

GR grade magnesium, calcium, strontium and barium