The Asian Journal of Experimental Chemistry, Vol. 3 No. 1&2 : 94-99 (June & Dec. 2008)

A probe into the dissociation and association behaviour of aqueous transition dodecylsulphates (30 – 50^{0}C)

ANIL KUMAR, TARUN AND SIMMI TYAGI

Accepted : *November, 2008*

See end of the article for authors' affiliations

Correspondence to:
ANIL KUMAR
Department of Chemistry, D.A.V. Post Graduate College (C.C.S. University), MUZAFFARNAGAR (U.P.) INDIA

ABSTRACT

The dissociation and association behaviour of aqueous transition metal (copper, zinc, silver, cadmium) dodecylsulphates, abbreviated as Cu(II)DS, Zn(II)DS, Ag(I)DS, Cd(II)DS,has been thoroughly examined using conductance measurements. The specific conductance, k(Scm^{-1}) for these solutions is found to increase with increasing concentration (mol dm^{-3}) and increasing temperature.The breaks in k-C plots give the values for critical micelle concentration, cmc.It is noticeable that cmc increases with increasing temperature.The data for degree of dissociation, α and dissociation constant, K_D for Ag(I)DS suggest greater tendency for dissociation as compared to Cu(II)DS,Zn(II)DS,Cd(II)DS systems.It is also observed that dissociation process is assisted by negative enthalpy and increase in entropy,($\Delta H^0_D < 0$ and $T\Delta S^0_D > 0$), whereas the process for micellisation or association is supported by free energy decrease and entropy increase ($\Delta G^0_A < 0$ and $T\Delta S^0_A > 0$).

Key words : Dissociation, Association, Transition metal dodecylsulphates, Thermodynamic parameters, Critical micelle concentration (cmc)

A number of research workers in the past have been resorting to the critical micelle concentration,cmc as an important tool to identify quality products. Researchers and academicians alike (Varma and Bahadur, 1975; Lelong *et al.*, 1951; Avakawa and Brain, 1980; Mehta *et al.*, 1979 and Mc Brain, 19395) have already shown a keen interest for various surface active agents, also termed as surfactants. They have been enthusiastic about their various facets *viz*. the physicochemical characterization, shape/size determination of micellar aggregates. W.J. Leigh and co-workers (Cook *et al.*, 2001; Leigh and Lio, 2002 and Owens *et al.*, 2003) have, of late, shown how significant organometallics are to the wide domain of surfactants. Several national/international publications (Mehrotra *et al.*, 1970; Jalicoeur and Philip, 1975; Sharma *et al.*, 1986; Kumar, 1994 and Malik *et al.*, 1984) have appeared in literature just to prove the merit of various physical properties of surfactants. Techniques such as viscometry and electrical conductivity have proved handy to study neutral polymer-micelle interactions (Wang *et al.*, 2004). Bumajdad and Eastoe (Bunajda and Eastoe, 2004) employed conductivity to study water in oil microemulsions stabilized by mixed surfactants. Tania *et al.* (Tania *et al.*, 2005) have resorted to spectroscopy and conductometry to probe interaction between water soluble poly {1, 4- phenylene-[9,9-bis (4-phenoxy butyl-sulfonate)] fluorene-2,7-diyl} copolymer and ionic surfactants. Aicart and co-workers (Aicart *et al.*, 2006) examined electrochemical, microscopic and spectroscopic characterization of vesicles and prevesicle nanostructures of mixed cationic surfactant systems.

Very recently researchers (Yoon *et al.*, 2006) have undertaken a study on electrically conductive bacterial cellulose by incorporation of carbon nanotubes. Kim and co-workers (Kim *et al.*, 2006) have, however, carried out a similar looking study using dielectrophoresis of surface conductance modulated single-walled carbon nanotubes with cationic surfactants. Hartl *et al.* (Hartl *et al.*, 2007) have investigated into ion sensitivity of surface conductive single crystalline diamond. Jacobs *et al.* (Jacobs *et al.*, 2006) have dealt with aspects on dynamics of alkylammonium intercalants within organically modified montmorillonite: Dielectric relaxation and ionic conductivity. Rajamani *et al.* (Yu *et al.*, 2006) have performed a study on carbon nanotube based transparent conductive thin films. NMR diffusometry and electric conductometric techniques have been employed to study interactions between gemine surfactants, 12-s-12, and beta cyclodextrin (Niisson *et al.*, 2006). Bufe and Wolff (Bufe and Wolff, 2006) have recently undertaken a study on switching electrical conductivity in an AOT-isooctane-water microemulsion through photodimerization of solubilized N-methyl-2-quinoline. Conductometric measurements have been found extremely handy to look into CTAB aggregation in aqueous solutions of ammonium based ionic liquids (Modaressi *et al.*, 2007). Conductometric method (Tunc and Duman, 2007) has also been a worthy tool to investigate interactions between some anionic dyes and cationic surfactants. Sarah *et al.* (Sarah *et al.*, 2006) have carried out work on