Association Constant And Free Energy Change Properties Of Sodium Salt Of 1-Butane Sulphonic Acid In Aqueous Meoh And Aqueous Dmso Composition

Sunil Kumar Jakkula¹, Radhika Veerati² and Adla Rajesh³

¹,²Department of Chemistry, SR University, Warangal-506371, Telangana, India
¹,²Department of Humanities and Sciences, S R Engineering College, Warangal-506371, Telangana, India
³Sumathi Reddy Institute of Technology for Women, Warangal, India.

Email: suneelsrec@gmail.com

Abstract. Various elements similar to density, viscosity, medium dielectric constant, ion-solvent relationships, and measurements of solvent-solvent, form properties of ion-conductance and ion solvation related to different solvent electrolytes. In solving it, ion-solvent relations pacify the ion. In the analysis of ion solvent associations and ion solvation activities, conductance data and association constant figures of distant electrolytes are used. Conductance and ion solving properties of 1-butane sulphonic acid sodium salt measured in aqueous methanol and aqueous DMSO of varying composition in the 298 K to 318 K-temperature range. Limiting molar conductance, ion pair interaction constants, KA using Shedlovsky limiting law to work out. With the percentage of water in the solvent mixture, $\Lambda_0$ increases. In 80% aqueous-methanol mixture, KA value and free energy changes are maximum, indicating that ion-solvent interactions are maximum in this composition of solvent blend and ion conductance properties as a purpose of clear ion-solvent links, including structural influence.

1. Introduction
Unlike solvent systems, ion conductance and ion solving properties of various electrolytes are stated to affect a variety of variables such as density, viscosity, dielectric constant all the way through. Conductance data and viscosity are useful for the study of ion solvent relationships and ion solving behaviour in turn of different electrolytes. In order to measure molar conductance data, solvent corrected behaviours of this salt are used. The limit molar conductance ($\Lambda_0$) values are obtained by applying Krauss-Bray and Shedlovsky equations. [1-4]Conductance values (alpha) obtained using the two models described above are in good agreement. Conductance data is reported in the range of 0-100 percent (V / V) in binary solvent systems of various compositions. The KA values are greater than 1 for each electrolyte (KA > 1), meaning that the proportion of ions remaining as ion pairs is higher than the free ions. Do not bear any charge, these ion pairs, so they do not contribute to conductance. Free energy transition, the thermodynamic parameter, provides valuable emphasis on the essence of ion-solvent interactions. The interaction of positive and negative ions with water molecules concludes that the energy of hydration depends on the sign of ionic charge and anion hydration heat is greater than that of the same size cation. This means better than cation interaction between anion and water molecules [5-6].
However, with such details, the passage is complete. Related information on the 1-butane sulphonic acid sodium salt is not available. The latest research explains the relationship between 298, 308, 313 and 318 K studies of the constant and free energy change properties of sodium salt of 1-butane sulphonic acid in an aqueous mixture of methanol and dimethyl sulfoxide at various temperatures [7-14].

2. Material and Methods
The conductivity bridge’s accuracy was found to be 0.02μS. In the water / aqueous organic solvent mixture of various compositions (v / v), a stock solution of 0.01 M sodium salt of 1-butane sulphonic acid was prepared in a range of 0 to 100 percent organic components. The solution has been diluted to a variety of concentrations with various solvent / solvent mixture quantities and the conductance values have been measured in the 298-318 K temperature range. The conductance values in the range 10-20μS are enclosed by solvent / solvent in the mixture used in this analysis. Solvent conductance is eliminated to obtain solvent conductance at any concentration. Analyses of molar conductance values are determined from experimental conductance by Shedlovsky restrictive law (eqn1) of medium, ion-solvent relations and solvent-solvent associations.

\[
S = \frac{1}{2AX^2} + \frac{1}{4AX^2} \quad \beta = \frac{A^2 \Lambda^5}{4 \sigma} \quad \Lambda^5 = \frac{825}{\eta \sigma \tau/2}
\]  

(1)

(2)

3. Results and Discussion
Molar conductance (Λ°) calculated from the right solvent specific conductance used for 1-butane sulphonlic acid sodium salt in aq-MeOH and aq-DMSO in various water compositions (v / v) at 298, 308, 313 and 318 K. Shedlovsky Conductivity Law to measure molar conductance at determined and present in table 1 at infinite intensity values.

| % (organic Component) | Λ°k   | KA   | Λ°k   | KA   |
|-----------------------|-------|------|-------|------|
|                       | Aq-MeOH |      | Aq-DMSO |      |
| T=298K                |        |      |        |      |
| 0                     | 88.60  | 4.50 | 88.60  | 4.50 |
| 20                    | 68.50  | 5.20 | 62.60  | 4.90 |
| 40                    | 60.00  | 5.40 | 56.04  | 13.30|
| 60                    | 53.60  | 10.30| 37.00  | 16.60|
| 80                    | 58.60  | 11.80| 35.40  | 26.10|
| 100                   | 67.50  | 2.90 | 33.80  | 20.50|
| T=308K                |        |      |        |      |
| 0                     | 107.29 | 4.19 | 107.29 | 4.19 |
| 20                    | 83.54  | 5.55 | 81.02  | 6.25 |
| 40                    | 74.31  | 7.06 | 62.18  | 11.60|
| 60                    | 66.74  | 9.39 | 45.72  | 18.79|
| 80                    | 67.05  | 10.84| 40.95  | 29.46|
| 100                   | 75.96  | 11.76| 38.17  | 21.83|
| T=313K                |        |      |        |      |
| 0                     | 118.27 | 4.45 | 118.27 | 4.45 |
The constant association (KA) of 1-butane sulphonic acid sodium salt increased with an increase in the organic portion percentage of the aqua-organic mixture and reached a maximum value of 100% organic solvent. The full KA value is 100 percent DMSO. The \( \theta \) values decrease and then increase marginally by up to 40-60 percent MeOH. The free change of energy (\( -\Delta G \)) is the same situation. As organic solvent is applied to water, the values of approximately 30 to 40 units of conductance are unexpectedly decreased.

Subsequently, only small variance is observed due to interactions of solvent-solvent and ion-ion that could be related to the rise in methanol-associated three-dimensional water structure. Differences in ionic conductance mean that in solutions with lower dielectric constant the ions are more solved. The net effect of ion solvation is a decrease in its mobility and hence its conductance. In terms of the ion-pair association constant (KA), the magnitude of ion-ion interactions is expressed. Experimental statistics show that KA > 1 shows that part of the ion exiting as ion-pairs is superior to free ions and that the formation of ion-pairs is more viable in organic solvent than in water. The restriction of molar conductance values is also based on the solvent composition.

These values in pure water are highest at each temperature. They are gradually decreasing by up to 80% through the addition of MeOH and DMSO to water. Methanol composition of 80 1-butane sulphonic acid percentage (\( v / v \)) and DMSO to sodium salt rise again up to 100 percent. The decrease of up to 80 percent is due to an increase in methanol percentage and DMSO may be due to a spin-down in the medium dielectric constant. The solvent-solvent relationship strengthened with the addition of co-solvent to water. As conductivity increases by temperature rise, this variation must be considered similar to the rate mechanism after the Arrhenius relationship.

KA values calculated at various temperatures are approximately constant, suggesting that the mechanism can be grouped as exothermic or endothermic progression if pair formation is not possible. The standard free energy shift convoy is designed with \( \Delta G^\circ_A = -RT\ln KA \) by ion pairing and is stated in table 2.
Table 2. Free energy change ($\Delta G$) values in kJ mol$^{-1}$ of sodium salt of 1-butane sulphonic acid in Aq-MeOH and Aq-DMSO organic mixtures.

| % of Component | Aq-MeOH | Aq-DMSO |
|----------------|---------|---------|
|                | 298 K   | 308 K   | 313 K | 318 K | 298 K | 308 K | 313 K | 318 K |
| 0              | 3.78    | 3.67    | 3.95  | 4.11  | 3.78  | 3.67  | 3.95  | 4.11  |
| 20             | 4.12    | 4.39    | 5.10  | 5.33  | 3.99  | 4.70  | 4.74  | 5.01  |
| 40             | 4.20    | 5.00    | 5.10  | 5.06  | 6.45  | 6.27  | 6.10  | 6.63  |
| 60             | 5.83    | 5.73    | 6.47  | 6.39  | 7.01  | 7.51  | 7.56  | 7.93  |
| 80             | 6.16    | 6.10    | 5.98  | 6.33  | 8.14  | 8.66  | 8.81  | 8.54  |
| 100            | 6.38    | 6.31    | 6.28  | 6.63  | 7.54  | 7.86  | 8.01  | 8.30  |

These are all negative values signifying spontaneous ion pairing which steadily rise in the ratio of organic component of solvent system that is liable as ion-pairs are more stabilize in low dielectric medium.

4. Conclusion
It is concluded that, ion-ion relations and free energy change are strong in high percentage of 80% Aq-MeOH and Aq-DMSO composition.

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