SOLUTE ORDERING BEHAVIOR OF L-ALANINE IN AQUEOUS SOLUTION

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ABSTRACT

L-Alanine is not particularly hydrophobic and is non-polar. L-Alanine is a small, naturally occurring amino acids are chiral and non-reactive hydrophobic methyl group (-CH3) as a side chain. Zwitterionic species of L-Alanine are often closely dependent on the aggregation behavior of the ionic liquids in the aqueous solution is very important from both fundamental and applied aspects. In this work, the purpose of this research is to determine the dissolution temperature of L-Alanine in aqueous solution by dissolution solubility experiment method and an assessment of solute ordering behavior of L-Alanine in aqueous solution, in terms of critical aggregation concentration (CAC). To determine the critical aggregation concentration, the measurement of conductivity meter have been carried out experimentally. Using conductivity method, CAC values of L-Alanine in aqueous solution were determined at different temperatures. It is known that, for aqueous solution of ionic surfactant, the critical aggregation concentration decreases at certain point and then increase with increasing temperature which creates a similar shape which can be seen from Figure 4.2 that is the curves of conductivity against concentration. The standard Gibbs energy of aggregation is also obtained by using van't Hoff's equation. The enthalpy of dissolution give positive value means the process appears in endothermic process, while the entropy show positive value. The contribution of positive value of enthalpy comes from the endothermic reaction of breaking solute hydrogen bonds to create a cavity for the solutes with water. The negative value of Gibbs energy support the fact suggested by Davey et al. whereas that this system exhibits negative deviation from ideal behavior, indicating strong solute-solvent interaction. It is suggested that there are strong interactions between the hydrophilic head of the molecules (consisting of NH_3^+ and COO^-) and the surrounding water molecules. The gravimetric method for solubility data of L-Alanine is also presented and discussed.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Over 75% of candidates for the development of drugs having low solubility (Robert Docherty, 2015). The major issue for drug development with the low solubility compounds in the formulation can be troublesome and getting complex. Then to increase the solubility for example the solubility of an antibiotic drug is by using an additives to interrupt the crystal lattice whereby it can be limiting the solubility. And the other alternative to increase the solubility is by using the co-crystals whereas it can be improve the dissolution rate for example the psychotropic drug with known dissolution challenges (Robert Docherty, 2015). From the pharmaceutical outlook, when developing a new chemical entity which is NCE into a product, the crystalline solid is usually the final form and as results, it would be usefulness to be able to accurately estimate the essential solubility of crystalline drug molecules. The turning point in the development of any new drug molecule is usually from the selection of the solid form and related to crystallization process.

The limited solubility of a compound in a solvent at a certain temperature, pressure and so on is usually the one of criteria for the principle of crystallization. A change of these criteria to a state where the solubility is lower will direct to the formation of a crystalline solid. For thousand of years, crystallization process has been applied in the