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MICELLIZATION OF TPGS-1000: UNDERSTANDING THE THERMODYNAMICS AND RELATED SOLUTE-SOLVENT INTERACTIONS USING CONDUCTOMETRIC TECHNIQUE

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ABSTRACT

TPGS-1000 has been shown to have wide array of potentials in the field of pharmaceutical sciences. The present study involves the determination of the critical micelle concentration (CMC) of TPGS-1000 in water so to revalidate the value from literature. The conductometric technique has been used for the determination of the CMC value. The obtained value is well agreed with that of the literature. The temperature dependence of the CMC in case of TPGS-1000 has been observed to be negligible. Further the observed specific conductance values during conductometric measurements have been used to evaluate the corresponding values of molar conductance. The values of activation energy related to the different concentrations of TPGS-1000 have been estimated using the Arrhenius equation. The thermodynamic parameters for the micellization process of TPGS-1000 in water have also been calculated.

CHAPTER 1

INTRODUCTION

1.1 Research Background

A surfactant is briefly defined as a material that can significantly reduce the surface tension of water when it is used in very low concentrations. It has two fundamental properties such as a tendency to adsorb at interfaces in an oriented fashion and form a micelle at higher concentrations that is what being called as CMC (Szymczyk & Jańczuk, 2007). In the beginning of twentieth century the report by W. B. Hardy, J. W. McBain and coworkers, indicated the existence of micelles while studying the electrolytic conductivity of carboxylate solutions and further the term "micelle" has been widely accepted and investigated (Danov, Kralchevsky, & Ananthapadmanabhan, 2013).

Nonionic surfactants are a group of chemical compounds that have been utilized widely in pharmaceutical, food, laundry, agricultural, and personal care products. These type of surfactants have plentiful advantages as compared to anionic, cationic and amphoteric surfactants because of their essential electrical neutrality and excellent chemical stability, high degree of compatibility with other product ingredients, lower sensitivity to electrolytes, and a low toxicity (Guo, Luo, Tan, Otieno, & Zhang, 2013).