UNIVERSITI TEKNOLOGI MARA

MICELLAR DISSOCIATION OF TPGS 1000 IN WATER: A DYNAMIC LIGHT SCATTERING (DLS) STUDY

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BACHELOR OF PHARMACY (Hons.)

2015

ACKNOWLEDGEMENT

I would like to express my gratefulness and thankful to Allah S.W.T for giving me strength and patience to complete this study on time. I would like to give my special thanks to my adorable Dr. Minaketan Tripathy for his endless guidance, limitless patience and the time spent for my study.

Besides, I would like to express my deepest gratitude to all the post graduate students and also the lab staff that contribute to my study me. I also want to express my special thanks to my lab mate, Nur Fatin Amanina binti Azman for her endless support and fullest cooperation along the study process.

In addition, I would like to greatly acknowledge my family especially my parents for their continuous support physically and mentally.

Last but not least, I would like to express my deepest gratitude to Faculty of Pharmacy, UiTM because provided me the place to do my study and any person that involved in my study directly or indirectly. I am very appreciated your help and kindness.

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ABSTRACT

Micellar dissociation is a phenomenon that occurs when the concentration of surfactants are increased beyond the critical micelle concentration (CMC). In this study, three different series of concentration of surfactant TPGS 1000 have been prepared by using direct dissolution of the surfactant in the water. The Malvern Zetasizer Nano ZS instrument was used in order to measure the size distribution of the micelles inside the solution system. The size parameters such as average particle size (Z Average), polydispersity index (PdI) and diffusion coefficient (D_0) whereas the zeta potential parameters such as zeta potential (ZP), mobility and conductance have been estimated in order to understand the micellar dissociation phenomenon. It is observed that the size of the micelles were reduced with the increased of concentration of TPGS 1000. The observed trend can be ascribed to the fact of micellar dissociation. D_0 which defines the velocity of Brownian motion shows the increased in the value beyond the CMC of TPGS 1000.

CHAPTER 1

INTRODUCTION

1.1 Background

Surfactant molecules are amphiphilic, in which they have both hydrophilic and hydrophobic regions. Amphiphilic in nature causes the surfactant to be adsorbed at the interfaces in a way that hydrophobic region are away from the aqueous environment. Hence, the forces of attraction between two water molecules and surface tension are reduced. The extent of adsorption at the interface can be calculated by Gibbs equation.

$$\Delta G = \Delta H - T\Delta S \qquad \text{(Equation 1.1)}$$

Where:

ΔG : Gibbs Free Energy

ΔH : Entalphy change

T : Temperature in Kelvin

ΔS : Entropy change

Surfactant is a compound which shows unique composition of interfacial and bulk properties (Hait & Moulik, 2002). Accoding to (Vittal, Gomathi, & Kim, 2006), surfactant has tendency to accumulate at the interface which is the boundary between two phases in an immiscible liquid. Due to the difference in the structural feature of a surfactants based on hydrophilic region of the surfactant molecule, they are basically