UNIVERSITI TEKNOLOGI MARA

# DEVELOPMENT AND EVALUATION OF WAGLINOL OIL NANOEMULSION USING HIGH PRESSURE HOMOGENIZER

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## ABSTRACT

Nanoemulsion is a type of emulsion. It consist of fine oil-in-water dispersions, with the droplets covering the size range of 20-200nm. It can be achieved through emulsification process. One of the processes is through high-pressure homogenizer (HPH). The mechanical effect of HPH governs nanoemulsion properties such as stability, partical size and uniformity. Consequently, the specific mechanical effects during emulsification are the interest when well-defined nanoemulsion properties are needed. Therefore, in this work, nanoemulsion study consisting of water, waglinol oil and a mixture of nonionic surfactants using HPH was performed. The optimum formulation was developed by direct emulsification which consists of waglinol oil, tween 80, span 80 and distilled water (2: 0.8: 0.2: 7). Waglinol oil pre-emulsion were homogenized at various pressures ranging from 40 MPa to 80 MPa using a lab scale HPH. Different cycles were applied ranging from 0 to 15 cycles. The influence of homogenizing pressure on the size, stability and zeta potential were determined. The size of the nanoemulsion does not differ relatively as the pressure and cycle of the HPH increase. The zeta potential of nanoemulsions are negative. Furthermore, different pressure and cycle of HPH produces different stability rate.

# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

Emulsion is made of two different liquids, mainly oil and water, in a form where one is distributed in the other (Lin and Chen 2006). They are thermodynamically unstable systems (Perrier-Cornet *et al,* 2005) which are stabilized kinetically. Therefore, the stability of an emulsion depends on the size and the composition of the emulsion droplets (Fernandez *et al*, 2004).

Emulsions with droplet covering the size range of 20-200nm are termed nanoemulsions, translucent emulsions, ultrafine emulsions, miniemulsions, submicron emulsions or fine-disperse emulsions (Maestro *et al*, 2008; Liu *et al*, 2006; Fernandez *et al*, 2004). Nanoemulsions are in metastable state, very fragile systems by nature (Sonneville-Aubrun, *et al*, 2004) and kinetically stable systems (Gramdorf *et al,* 2008). Their thermodynamic stability gives advantages over unstable dispersions (emulsions or suspensions) because they have a long shelf life (Shakeel *et al,* 2008).