

**THE DEVELOPMENT OF MICROEMULSION  
BASED ANODYNE ULTRAVIOLET (UV)  
FILTERS INCORPORATED WITH  
*Melaleuca cajuputi* EXTRACT**

**MUHAMMAD HANIF BIN SAINORUDIN**

**MASTER OF SCIENCE  
UNIVERSITI MALAYSIA TERENGGANU**

**2017**

**THE DEVELOPMENT OF MICROEMULSION  
BASED ANODYNE ULTRAVIOLET (UV)  
FILTERS INCORPORATED WITH  
*Melaleuca cajuputi* EXTRACT**

**MUHAMMAD HANIF BIN SAINORUDIN**

**Thesis Submitted in Fulfillment of the Requirement  
for the Degree of Master of Science in the School  
of Fisheries and Aquaculture Sciences**

**Universiti Malaysia Terengganu**

**November 2016**

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science

**THE DEVELOPMENT OF MICROEMULSION – BASED ANODYNE  
ULTRAVIOLET (UV) FILTERS INCORPORATED WITH  
*Melaleuca cajuputi* EXTRACT**

**MUHAMMAD HANIF BIN SAINORUDIN**

**November 2016**

**Main Supervisor : Nor Fazliyana Mohtar, Ph.D**

**School : School of Fisheries and Aquaculture Sciences**

For the past few decades, herbal sunscreen have brought major attraction due to their beneficial value such as high ultraviolet ray absorption. Besides, it also has great potential to possess antibacterial activity. Due to these advantages, a series of sunscreen formulations with the combination of herbal extracts were proposed. In this study, four formulations were successfully developed with different composition comprises of nonionic surfactant, co-surfactant, water and essential oil of *Melaleuca cajuputi* as active ingredient. The percentage ratio by weight of surfactant:co-surfactant:water were F1 (28:22:50), F2 (10:10:80), F3 (26:24:50) and F4 (30:20:50). This study was also conducted to explore the ability of *M. cajuputi* to promote a good anodyne ultraviolet (UV) filter which can lead to improvement in the treatment of sun burn due to the overexposure to UV radiation. All of the sunscreen formulations based on microemulsion system as the medium were formulated and analyzed using several spectroscopic and analytical techniques such as Gas Chromatography-Mass Spectroscopy (GC-MS), ternary phase diagram, UV-visible Spectroscopy, morphology of sample surface by Scanning Electron

Microscope (SEM), rheological behavior, conductivity by Electrochemical Impedance Spectroscopy (EIS), antibacterial activity, cytotoxicity, and skin analysis. Additionally, the color, pH, and Sun Protection Factor (SPF) of each formulations were also determined. The results revealed that formulation 4 which consisted of Tween 80 as nonionic surfactant, olive oil as co-surfactant, water, as well as *M. cajuputi* essential oil demonstrated highest stability of oil-in-water microemulsion formulation compared to the formulations 1, 2 and 3. Moreover, this formulation also exhibits high SPF value and good performance towards human skin application. Overall, it can be potentially commercialize as hybrid innovation sunscreens formulation in increasing the efficiency of skin prevention from UV radiation.