CHAPTER I
INTRODUCTION

Currently, the increasing price of fossil oil has been a major problem. Many researches have been finding alternative option to improve this situation. One of the most feasible candidate is the increased production of bio-diesel to reduce the demand for fossil oil. However, the downside to the production of bo-diesel is the production of glycerol as a by-product. Glycerol has been an attractive chemical for many industries. It has several advantages over other substances. With unique physical and chemical properties (nontoxic, edible, biosustainable and biodegradable compound), it can be used as a starting material for various high-value added products such as glycidol, glycerol esters, polyglycerols and polyglycerol esters. Moreover, glycerol is obtained as a 10% by-product in transesterification producing biodiesel which has been increasingly used as a substitute for diesel fuel. The rise of biodiesel production leads to glycerol becoming oversupply and cheaper material. Therefore, the utilization of glycerol for the synthesis of value-added chemicals is of great advantage for the industries.

Among its applications, glycerol could be used as a starting material for the synthesis of polyglycerol which is used directly or esterified with fatty acid for use as an emulsifier in the cosmetics and food industry. Products based polyglycerols are used in surface-active agents, plasticizers, adhesives, lubricants, antimicrobial agents, medical specialties, and dietetic foods.

Polyglycerols are normally prepared by condensation of glycerol at elevated temperature in the presence of homogeneous catalysts. The use of homogeneous catalysts provides high conversion but quite low selectivity. The resulting product is a mixture of unreacted glycerol and polyglycrols contaminated with reaction by-products, acrolein. Therefore, they need further processing to separate impurities and catalysts from the products. This procedure leaves large amounts of basic aqueous waste, which is not environmentally friendly. On the other hand, heterogeneous catalysts were not so active but high selectivity. Consequently, they would greatly simplify the impurities and catalysts removal from the products. Polyglycerol ester is prepared by esterifying polyglycerol with fatty acids or tranesterifying polyglycerol

with monoglycerides, diglycerides, or trigltcerides in the presence of a calcium containing compound.

In this work, the glycerol etherification reaction over alkaline earth metal catalyst (CaO) was investigated as the effect of reaction time on selectivity of di– and triglycerol. The potential to produce polyglycerol ester from fatty acid via esterification reaction were studied in the dependence of the reaction temperation, and fatty acid:polyglycerol molar ration