

CHAPTER I

INTRODUCTION

Due to increasing in crude oil prices, limiting resource of petroleum-based diesel fuels and environmental concerns, a search for alternative fuels have gained significant attention over the years. Among different possible resources, biodiesel derived from triglycerides of vegetable oils and animal fats present a promising alternative to substitute petroleum-based diesel fuels. In Thailand, if the full-scale production of biodiesel is existed, the large amount of glycerol will be obtained as a by-product.

Glycerol is widely used in many applications due to its unique physical and chemical properties. It can also be used as a starting material for many other high-value added chemicals such as glycidol, glycerol esters, polyglycerols and polyglycerol esters. Polyglycerols are interested because they are used in many industries. Furthermore, they are intermediate in the formation of polyglycerol esters. Both polyglycerols and polyglycerol esters are also used in the formulation of various cosmetic and personal care products.

Polyglycerols are obtained from the polymerization of glycerol, which derived from vegetable oil and animal fats. Polyglycerols are soluble in water, alcohol, and many polar solvents. They offer greater flexibility and functionality than glycerol. They are incorporated in a variety of consumer products to perform many functions such as emulsification, wetting, foaming, thickening, dispersion, solubilization, and mildness. Therefore, the main uses of polyglycerols are in foods, cosmetics, pharmaceuticals, emulsifiers, and surfactants industry.

Generally, polyglycerols are prepared by polymerization of glycerol at elevated temperature in the presence of homogeneous catalysts (sodium hydroxide, potassium hydroxide). The homogeneous catalysts give high conversion but low selectivity. Moreover, the uses of homogeneous catalysts lead to several problems. The important problems are impurities, less selectivity and catalyst separation. Therefore, they need further processing to separate impurities and catalysts from the product.

The uses of heterogeneous catalysts were interesting because they would greatly simplify and economically remove impurities and catalysts from the products. Furthermore, the main advantages of heterogeneous catalysts are high selectivity, and reducing formation of by-product.

The objective of this work is to study the synthesis of polyglycerols having low degrees of polymerization (di- and triglycerol) using homogeneous and heterogeneous catalysts. The base homogeneous catalysts which were used in this study are sodium hydroxide, potassium hydroxide, and calcium hydroxide, whereas the heterogeneous catalysts were zirconium oxide, calcium oxide, and magnesium oxide. Parameters such as types of catalyst, catalysts concentration, and reaction time were examined. Therefore, this work compared the production of polyglycerol by using base homogeneous catalyst and base heterogeneous catalyst as catalyst in polymerization.