



## CHAPTER I INTRODUCTION

Glycerol (propane-1, 2, 3-triol) is a by-product from transesterification of triglyceride in biodiesel production. With the rapidly growth of biodiesel, glycerol production also extremely increases, resulting in lower of its value. Therefore, increasing the utilization of glycerol by converting it to higher value products is interesting for entire biodiesel industry.

Glycerol is a simple polyol compound. It is a colorless, odorless, and viscous liquid that can be found in many applications such as in pharmaceuticals, toothpaste, cosmetics, tobacco, foods and etc. Propylene glycol can be converted from glycerol for use in foods, cosmetics, pharmaceuticals, antifreeze, and liquid detergents. Glycerol can also be dehydrated to acrolein, which is a significant bulk chemical used as a feedstock for acrylic acid production, pharmaceuticals, fiber treatments, and herbicide. Moreover, glycerol has also been considered to be a feedstock for new industrial fermentations in the future.

Among its derivatives, Diglycerol, which is derived from glycerol by base-catalyzed etherification, is one product class of interest and it is used as a starting material for the production of surfactants, cosmetics, food additives, and lubricants. Recently, diglycerol derivatives were proposed as novel oligomeric liquid crystals. Hence, there is a market for diglycerol.

Nowadays, diglycerol is produced from etherification of glycerol by catalyst and purified by distillation. But the selectivity of the product, which is so difficult to control, is still the main problem of this process. Diglycerol can be further reacted with glycerol to obtain tri, tetra, and polyglycerol. So, the industries have tried to find out the process which can produce high activity and suitable diglycerol selectivity.

They found that the use of basic catalysts for example: calcium oxide gave more selectivity for diglycerol while barium oxide gave more glycerol conversion. And another catalyst was mesoporous catalyst like zeolite as a shape selection for increasing the selectivity of diglycerol. However, leaching of metals is the major problem for these catalysts.

In this work, SBA-15 and  $\text{Al}_2\text{O}_3$  were used as a support in order to improve the selectivity of diglycerol. And Etherification of glycerol catalyzed by either calcium oxide or barium oxide on SBA-15 and  $\text{Al}_2\text{O}_3$  was studied. Calcium oxide and barium oxide on SBA-15 and  $\text{Al}_2\text{O}_3$ , which synthesized by impregnation method, and calcium oxide and barium oxide on  $\text{Al}_2\text{O}_3$ , that prepared by SILD method, were selected to use as the heterogeneous catalysts for providing the high activity, high selectivity, decrease of metal leaching problem, and many commercial advantages.