CHAPTER I
INTRODUCTION

The development and commercial use of biodiesel has been encouraging and rapidly expanding. The prominent superiority of biodiesel over petroleum diesel towards health and environment (free sulfur content, low content of harmful emission) as well as engine performance. Despite the rapid pace of biodiesel development and commercialization, there are several key challenges emerging and these must be addressed efficiently.

One of the promising routes is the conversion of glycerol to propylene glycol by glycerol dehydroxylation. Propylene glycol is a commodity chemical used as a raw material in a various applications, e.g. unsaturated polyester resins, functional fluids, pharmaceuticals, foods cosmetics, liquid detergents, tobacco humectants, flavors and fragrances, paints, and animal feeds.

The catalytic dehydroxylation of glycerol to propanediol can be carried out in the presence of metallic catalysts and hydrogen. A previous study (Sitthisa, 2007) has demonstrated the effectiveness of Cu/Al_2O_3 catalyst. The results showed that 100% glycerol conversion and 90% propylene glycol selectivity were obtained. However, the conversion decreased drastically after 6 h. Swangkotchakorn (2008) introduced ZnO into Cu/Al_2O_3 catalyst and found that the addition of ZnO could prolong the stability of the catalyst. Chirddilok (2009) found that the $Cu\text{-}ZnO/Al_2O_3$ catalyst showed the best catalytic activity compared with Cu/Al_2O_3 and Cu/ZnO catalysts. The maximum activity was obtained from the catalyst prepared by co-precipitation as compared with incipient wetness impregnation. Panyad (2011) concluded that the $Cu\text{–}ZnO/Al_2O_3$ catalyst prepared by the incipient wetness impregnation method exhibited the highest catalytic activity and stability as compared to the ones prepared by the Sol-Gel and co-precipitation methods.

Glycerol naturally occurs during the biodiesel production process and is specifically produced in the transesterification process. The glycerol produced at this stage is crude glycerol and is about 40 to 80% pure still containing contaminants like soap, methanol and water. In order to turn this crude glycerol into a usable state for existing or emerging uses, a purification process must take place. During this refinement process residual organic matter, water, salt, methanol, and odors are removed. There are many different types of glycerol grades ranging from crude glycerol to refined glycerol.

In the present work, the catalytic dehydroxylation of glycerol to propylene glycol was conducted over the Cu-ZnO/Al_2O_3 catalyst prepared by incipient wetness impregnation method. The effect of feedstock purity on catalytic activity was investigated.