CHAPTER I
INTRODUCTION

Owing to energy crisis and environmental impacts of fossil fuel use which make dramatically rising in oil price. Not only transportation using petroleum fuels, such as gasoline and diesel, are affected by these increased petroleum prices, but also a large number of products derived from petroleum, leading to global economic concern. Moreover, combustion of these fossil fuels is considered to be the most prominent emitters of greenhouse gases, especially carbon dioxide, which contributes to global warming and climate change issues. Therefore, the renewable energy has become one of possible method for these problems. There are many renewable or sustainable energy forms that are being researched and used at the present. The main forms of renewable energy are solar energy, hydropower, wind and tidal power, and especially biomass which are illustrated in Figure 1.1.

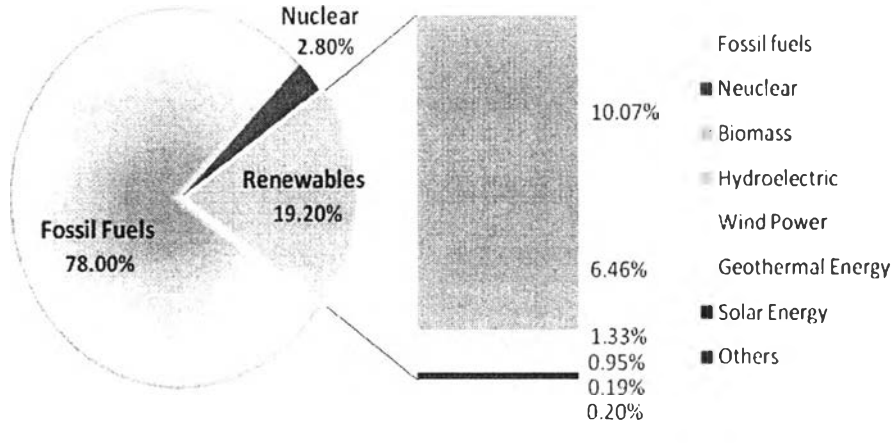

Figure 1.1 Schematic of renewable energy share of global final energy consumption in 2008 (Sawin and Martinot, 2010).

Corn cobs is one of agricultural waste, which can be produced in Thailand approximately 4 million tons annually. In addition, butanol is being an important renewable energy, which can be produced by fermentation of biomass at the present.

However, the conversion of corn cobs into fermentable sugar is difficult because of many enzymatic hydrolysis limiting factors.

The main factors that affect to enzymatic hydrolysis are the crystallinity of cellulose, substrates available area, and the presence of lignin and hemicelluloses (Alvira *et al.*, 2009). Owing to these factors, pretreatment is the important step to prepare the materials for enzymatic degradation. Different pretreatment methods have different effects; therefore, the appropriate pretreatment method and conditions depend on the type of agricultural wastes or lignocellulosic biomass.

There are several pretreatment methods, which can be classified into biological, physical, chemical, and physico-chemical pretreatments (Taherzadeh and Karimi, 2008). Alkali pretreatment, one of chemical pretreatment, can remove lignin and a part of the hemicelluloses which result in increase the accessibility of enzyme to the cellulose (Binod *et al.*, 2009). Alkali pretreatment can be operated at low temperature even ambient condition but need long time and high concentration of base. However, lower temperature is more effective because some useful component in lignocellulosic biomass might be decomposed at high temperature (Zhu *et al.*, 2005). Microwave-based pretreatment might be an alternative pretreatment method to operate at low temperature. Among alkali, sodium hydroxide is a suitable chemical reagent for combining with microwave pretreatment (Keshwani *et al.*, 2007).

The purpose of this work is to optimize the condition of combination pretreatment of corn cobs using microwave and sodium hydroxide (0.75 % to 3 % (w/v)) at the temperature range of 60 to 100°C for 5, 10, 20 and 30 minutes. In addition, this work also investigates the suitable condition for enzymatic hydrolysis.