CHAPTER I
INTRODUCTION

In the last several decades, there has been an argument over the energy policy in many countries. Due to energy consumption has increased and many countries have become industrialized countries; therefore, the world energy consumption is projected to increase by 50%, by the year 2020 (http://www.sunnydaysolar.net/index.phpt). In addition, they are not a renewable energy resource and the combustion of fossil fuels results in greenhouse gas emissions and accelerates the global climate change. Therefore, the reduction of greenhouse gas emissions has become a primary focus of environmental solution in countries around the world. Figure1.1 showed that using corn-based ethanol instead of gasoline reduces greenhouse gas emissions by 19% to 52%, depending on the energy source. Using cellulosic provides a greater benefit by reducing greenhouse gas emissions by up to 86%.

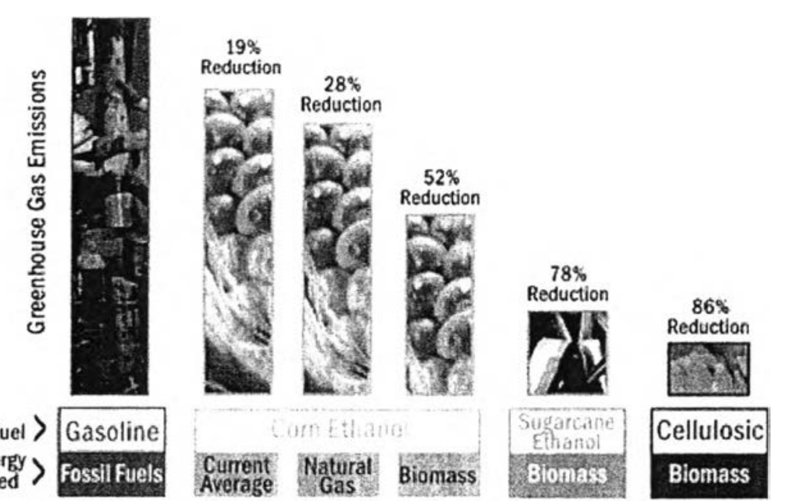

Figure 1.1 Comparison to gasoline, ethanol made from cellulose and produced with power generated from biomass byproducts in reducing greenhouse gas emissions.

There are many types of biofuel can be produced from lignocellulosic biomass such as bioethanol and biobutanol. They are of interest as fuels because they have characteristics which allow them to be used in current engines. The advantages of fuel blends are alcohol tends to increase the octane rating, which is particularly important in unleaded fuel, and reduce carbon monoxide (CO) emissions from the engine.

Corn is one of the most important agricultural crops in Thailand and it produces corn cob residue around 1.1 million ton per year, which is normally used as animal feed and the elimination of the corn cobs residue lead to an environmental problem. In order to increase its value, the most attractive is to convert it to fermentable sugar. Corn cob is mainly composed of cellulose, hemicellulose, and lignin. This natural structure makes it difficult to hydrolyze into fermentable sugar.

The enzymatic hydrolysis is an interesting way to produce sugars from cellulose wastes because of its mild operating condition, regarding pH and temperature, and the absence of by-products (Carrillo *et al.,* 2005). Therefore, efficient of pretreatment method has improved enzymatic hydrolysis to remove lignin and hemicellulose, disordered the crystalline structure of cellulose, and increased the porosity of the materials to make cellulose more accessible to the enzyme for a maximal reducing sugar production.

There are many research work related with pretreatment methods; the microwave irradiation is widely used because of high heating efficiency, easy operation, and taking short time. Microwave heating pretreatment can break down lignin-hemicellulose complex and expose more accessible surface area of cellulose to cellulase (Cheng *et al.,* 2011). Microwave irradiation can be easily combined with chemical reaction and, in some case, accelerate the chemical reaction (Zhu *et al.,* 2005). Recently, a few reports combined microwave with alkali pretreatment, which could operate process at low temperature. Alkali pretreatment removes lignin and increased the biodegradability of cellulose owing to cleavage of the lignin bond.

The objective of this work is to investigate the optimal condition of pretreatment of corn cobs for enzymatic hydrolysis and the combination pretreatment of corn cobs using microwave and potassium hydroxide.