CHAPTER I
INTRODUCTION

Global demand for energy continues to grow due to rapidly expanding human population and increase of the industrial prosperity in developing countries. The major energy demand is still supplied from conventional fossil fuels, such as oil, coal and natural gas. Utilization of fossil fuels has drastically increased the level of greenhouse gasses (Ballesteros *et al.*, 2006). Therefore, there is a great interest in exploring alternative energy sources to maintain the sustainable growth of society. Bioethanol is another renewable source. They are cleaner burning than fusel fuel, short cycle growing plants, and burning fuel made from them does not add CO_2 to the atmosphere.

Lignocellulosic biomass, such as agricultural residues (corn stover and wheat straw), wood, and energy crops, is an attractive material for bioethanol fuel production since it is the most abundant reproducible resource on the Earth (Bohlmann *et al.*, 2006). Among the lignocelolusic biomass, *Napier grass* (*Pennisetum Purpureum*) is a suitable plant species for ethanol production. They grow rapidly, have high dry-weight productivity, a short growth period, high adaptability, high energy productivity, low production cost, and are easily transported and cultivated (Tsal *et al.*, 2009).

The factors that have been identified to affect the hydrolysis of cellulose include porosity (accessible surface area) of the biomass materials, cellulose fiber crystallinity, and lignin and hemicellulose contents. Pretreatment is an important tool for cellulose conversion process. The purpose of the pretreatment is to remove lignin and hemicelluloses, reduce cellulose crystallinity, and increase the porosity of materials (McMillan *et al.*, 1994).

Microwave is an alternative method to improve efficiency of the pretreatment due to its high heating efficiency, easy operation; rapid heating by microwave, which facilitates the disruption of their recalcitrant structure; and microwave could be easily to combine with chemical reaction. Microwave-assisted alkaline pretreatment was investigated Zhu *et al* (2006) and Hu *et al* (2007).

The objectives of this work are to investigate the optimal pretreatment condition of two-stage pretreatment, including microwave-assisted alkaline and microwave-assisted acid, and to compare the amount of monomeric sugar concentration obtained from different reagent types.