

AN ABSTRACT OF A THESIS

MICROWAVE-BASED ALKALI PRETREATMENT OF NEWSPAPER FOR ENHANCED METHANE PRODUCTION

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As a result of change within the global atmosphere and the threat of an energy crisis from depleted fossil fuels and slowed crude oil production, there is an increased interest in renewable energy. With the generation of less carbon dioxide per energy unit and production of fewer atmospheric pollutants than other fossil fuels, as well as a pipeline distribution system already in place, an interest has developed for methane as a renewable energy source. Microwave-based pretreatment of newspaper for enhanced methane production was studied. Studies were conducted to determine methane production of newspaper samples pretreated with different agents, concentrations of agents, and microwave times.

It was determined that an alkali was a better microwave-based pretreatment agent than an acid, and an alkali at 2% concentration with a microwave radiation time of 10 minutes was more effective than 1% with five minutes. NaOH was found to be a better pretreatment agent than $\text{Ca}(\text{OH})_2$ or Na_2CO_3 and the combination of NaOH at 2% and 10 minute radiation time was more effective than other concentration and microwave time combinations. It was also determined that the enzyme cellulase enhances methane production when paired with microwave-based pretreatment using NaOH. It was concluded that the optimum pretreatment conditions for enhanced methane production were NaOH at 20,000 mg/L, a microwave radiation time of 10 minutes, and an introduction of the enzyme cellulase in the pretreatment process.