



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title:
Insight into the Influence of Chemical Pretreatment and Alkali and Alkaline Earth Metals (AAEM) on Biomass Pyrolysis
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SHORT ABSTRACT

Pyrolysis is one of the emerging techniques for waste management through the production of bio-oil and bio-char. Bio-oil is a source of numerous platform chemicals that can be extracted. However, the low fraction of these platform chemicals and high moisture content, acidity and oxygen content (low HHV) of bio-oil limits its application and storage stability. Hence addressing these challenges is essential for improving its range of applications.

There are three primary objectives of this research work. The first was to determine the impact of various chemical pretreatment techniques on the physical and biochemical characteristics of lignocellulosic biomass. Variations in its composition were quantitatively analyzed. The pyrolytic behavior of the native and treated feedstocks was analyzed using TGA (Thermogravimetric analysis). The second objective was to investigate the effects of chemical pretreatment on the pyrolytic products and their application in enhancing the production of selective chemicals present in bio-oils. Laboratory experiments were conducted using a semi-batch pyrolysis reactor. Further mapping of changes in properties of bio-oils with changes in the physical properties of treated biomass was carried out to provide a deeper understanding of the effect of chemical treatment on pyrolysis. The third objective was aimed at gaining insight into the effect of inherent inorganic ash. Although they exist in only small fractions, they acted as catalysts and significantly shifted product formation mechanisms. Individual effects of alkali and alkaline earth metal (AAEM) cations with varying anions on biomass pyrolysis were examined to understand their effect on the pyrolysis mechanism.