

Master Thesis Defend Examination

Presented by

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Green Solvent-Based Biomass Conversion Under Mild Conditions for Sustainable Bioproduct and Biofuel Production

Abstract

This study explores the application of green solvents for converting agriculture wastes into useful bioproducts via chemical reaction at moderate reaction conditions. This work examines process optimization through the selection of appropriate solvents for specific biomass sources including formic acid, methanesulfonic acid (MSA), and deep eutectic solvents (DES). Process optimization was achieved through comparative analysis of response surface methodology (RSM) and a genetic algorithm (GA) to determine the best operating parameters that produce maximum ethanol yields. Significantly, the incorporation of MSA in pretreatment showed 1.73 times higher sugar yield than without MSA. In addition, process simulation using Aspen Plus® software was carried out to analyze the recyclability of the solvent and thereby explore ways through which the costs of operating the process can be minimized. Simulation analysis showed that by employing optimization techniques such as GA, one could greatly decrease the costs associated with raw material pre-treatment in contrast to using traditional methods of statistical analysis. Further enhancement was done using ultrasonication-assisted pretreatment, where the combined effect of these waves with advanced optimization led to lower solvent requirements and higher yields. To demonstrate the versatility of the proposed green solvent system, the study further extended its application to DES was used to extract saponin from industrial tea leaves. This was done using RSM to optimize extraction parameters. Finally, a comprehensive Life Cycle Assessment (LCA) confirms that this integrated biorefinery scheme is environmentally benign and represents a sustainable manufacturing framework for the circular economy.

Date

14th May 2026

Time

1.00 PM

Venue

1007, 10th floor
at TGGGS

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