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LIGNOCELLULOSE BIOMASS DELIGNIFICATION USING ACID HYDROTROPE AS GREEN SOLVENT: A MINI-REVIEW

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Efficient and cost-effective conversion of lignocellulosic biomass into usable forms of energy presents unique challenges. Lignocellulosic biomass, comprising cellulose, hemicelluloses, and lignin, necessitates advanced conversion technologies. Common commercial delignification techniques, including kraft pulping, sulfite pulping, acid hydrolysis, and organosolv pulping, often involve harsh conditions leading to structural changes in lignin and environmental impacts. To address these issues, acid hydrotropes have emerged as a promising method for lignin extraction. Acid hydrotropes, represented by p-toluenesulfonic acid (p-TsOH), enable the solubilization of hydrophobic substances like lignin. This mini-review provides an overview of various lignocellulose fractionation techniques and explores the acid hydrotrope approach. The mechanism behind acid hydrotropic fractionation is discussed, and its performance is evaluated. In conclusion, the review emphasizes the pivotal role of the acid hydrotrope approach in advancing lignocellulosic biomass conversion technology, promoting a sustainable and efficient bio-based economy.

Keywords: lignocellulose, delignification, lignin, acid hydrotrope, p-toluenesulfonic acid (p-TsOH)

INTRODUCTION

There has been a remarkable surge in global interest in renewable resources in recent years as researchers strive to address the pressing challenges of climate change and sustainable development.[1] Among the many renewable resources available, lignocellulosic biomass has emerged as a promising clean and sustainable energy source.[2] Lignocellulosic biomass is the non-edible plant material found in agricultural residues, forest residues, dedicated energy crops, and organic waste.[3] This abundant and widely available biomass resource holds tremendous potential for meeting energy demands, while minimizing the environmental impacts of traditional fossil fuel consumption. The growing interest in lignocellulosic biomass stems from several factors. Firstly, lignocellulosic biomass is considered a carbon-neutral energy source.[4] When it is utilized for energy production, the carbon dioxide released during combustion is offset by the carbon dioxide absorbed during the growth of the biomass feedstock. This feature makes lignocellulosic biomass a valuable tool in mitigating greenhouse gas emissions and combating climate change. Secondly, lignocellulosic biomass offers a sustainable alternative to finite fossil fuels, contributing to environmental degradation.[5] As an abundant and renewable resource, lignocellulosic biomass can provide a reliable energy supply, while reducing dependence on depleting fossil fuel reserves. Furthermore, its utilization can help mitigate other environmental issues, such as air pollution and water contamination associated with traditional energy sources.[6] Moreover, processing lignocellulosic biomass for energy production can create economic opportunities and stimulate rural development. Communities can generate income by establishing biomass supply chains through cultivation, harvesting, transportation, and conversion processes. This can contribute to the

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