

Recovery of Lignin Using Separation by Heat "RUSH" Process (2024-005)

Cost-effective lignin recovery from agricultural residues without foul odors using Clemson University's RUSH process.

Market Overview

The global lignin market is expected to reach \$1.47 billion by 2030, with a CAGR of 4.5% from 2024 to 2030. This growth is driven by increasing demand for lignin as a sustainable material in various applications, such as biopolymers, carbon fibers, construction materials, and biofuels. The growing focus on reducing greenhouse gas emissions and promoting renewable resources, especially in regions like Europe and North America, are key drivers in the market's expansion.

Technology Overview

The RUSH (Recovery Using Separation with Heat) process recovers lignin from acidified black liquor by using heat to induce phase separation, resulting in a solid lignin phase and a liquid spent black liquor phase, simplifying recovery without the need for filtration or centrifugation. The process works effectively with wood and non-wood sources, such as agricultural residues including wheat straw and corn stover, and avoids the foul odors typically associated with wood-based sources. RUSH utilizes standard alkaline agents (e.g., sodium or ammonium hydroxide) and acids (e.g., acetic, sulfuric). Increasing temperature enhances the solids content of the lignin phase, improving its purity and robustness. Lab scale tests have yielded up to 75% of the lignin present in black liquor, and its elimination of energy-intensive steps like evaporation making it a cost-effective lignin precipitation method.

Applications:

Biopolymers, Biofuels, Construction, Adhesives, Carbon Fiber

Development Stage:

Lab scale prototype

Advantages:

Sustainable: Renewable lignin sources reduce petrochemical reliance.

Low Cost: Simplified precipitation process without filtration or centrifugation.

Versatility: Broad applications across multiple industries.

Market Growth: 4.5% CAGR driven by sustainability demand.

| App Type | Country | Patent No. | CURF Ref. No. | Inventors |
|-------------|---------------|------------|---------------|--------------------------------|
| Provisional | United States | NA | 2024-005 | Dr. Mark Thies Bronson Lynn |



About the Inventors

Dr. Mark Thies

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Dr. Mark Thies earned his Ph.D. from the University of Delaware. His research efforts are focused on sustainable energy and materials based research where thermodynamics, phase equilibria, and separations play a key role. His work aims to explore poorly defined systems with unexploited potential.



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Bronson Lynn is recent graduate with a Ph.D. from the Chemical and Biomolecular Engineering Department at Clemson University.

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