VOC and HAP Recovery Using Ionic Liquids
Absorption of VOCs and HAPs to Lower Emissions and Reduce Costs

Manufacturing wood composites, paper, and lumber produces unwanted by-products, such as volatile organic compounds (VOCs) and hazardous air pollutants (HAPs). These by-products are difficult to manage because the concentrations are low. Current air pollution treatment technologies are not economically favorable due to high operating costs involving intensive resources and the formation of NOX.

A new technology promises to remove VOCs and HAPs from wood processing exhaust gases by absorbing them into a regenerative room temperature ionic liquid (RTIL). This technology will use significantly less energy than current technology and provide the collected pollutants in a concentrated stream that can be burned for fuel or distilled into products.

Benefits for Our Industry and Our Nation

• Reduces natural gas use by 60%
• Decreases electrical consumption
• Provides additional savings due to fuel recovery
• Reduces capital and operating costs
• Lowers CO₂ emission
• No formation of NOX

Applications in Our Nation’s Industry

Ionic liquid absorption technology can be used to remove VOCs and HAPs from air streams, replacing the removal systems that are currently being used by the wood processing industry.
Project Description

The main objective of this project is to develop a RTIL absorption system for removal of VOCs and HAPs from exhaust streams at wood product facilities.

Specific project objectives include:

• Synthesize RTILs and optimize their chemical structures for a VOC/HAP absorption process
• Evaluate solubility and removal of VOC compounds in the synthesized RTILs and determine other chemical and physical properties important for absorption
• Construct continuous prototype absorption system using the RTIL most suited for VOC removal
• Determine ability of the RTIL to clean exhaust during long-term trials on wood dryer and press exhaust

Barriers

• Trace chemicals located in the exhaust is an unknown
• Cost of ionic liquids (this barrier would be eliminated if large quantities are produced; researchers have switched to using the phosphonium class of ionic liquids which are less expensive and synthesized from environmentally benign chemicals)
• Ability to remove the absorbed chemicals from the ionic liquid (higher temperatures can overcome this, however, increased temperatures causes more chemical breakdown of the contaminates, which are difficult to remove)

Progress and Milestones

• Tested ionic liquids as candidates for absorption using surrogate compounds (methanol, formaldehyde, etc.) (Completed December 2005)
• Identified RTILs to be good candidate for effective removal of VOCs and HAPs
• Conduct long-term testing of absorption/desorption prototype apparatus with RTIL on actual exhaust from a lumber kiln, a green composite furnish dryer, and a press
• Determine all parameters for commercial design

Commercialization

The commercial advantage lies in energy savings. The commercial likelihood of this project increases when natural gas prices increase. Commercial firms are encouraged to develop and market a full-scale version of this technology.

Project Partners

Oregon State University
Corvallis, OR

Weyerhaeuser Corporation
Federal Way, WA

Louisiana Pacific Corporation
Portland, OR

Boise Cascade Corporation
Boise, ID

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