RESEARCH in Progress

Forest Products Laboratory

Disposal of Chemically Treated Wood Products Used in Housing

As of January 1, 2004, the U.S. Environmental Protection Agency (EPA) disallowed the use of chromated copper arsenate (CCA) as a preservative in most wood products intended for residential use. Wood treated with CCA had been commonly used in play structures, decks, picnic tables, landscaping timbers, residential fencing, patios, sill plates, boardwalks, and other structures. Although the EPA has not concluded that there is unreasonable risk to the public from these products, they do believe that any reduction in exposure to arsenic is desirable.

Residential retaining wall fabricated from treated (green) timbers.

In this study, we are examining two environmentally safe methods for disposing of CCA-treated wood used in housing.

Background

Wood treated with CCA as a preservative has been used in the United States for decades. In 2004, an estimated 430 million cubic feet of CCA-treated wood had to be removed from service and disposed of, which resulted in an enormous problem. Specifically, what is to be done with the millions of board feet that exist? Landfilling is an option but not an ideal one for several reasons, including cost, potential exposure from leached copper, chromium, and/or arsenic, and space requirements. Obviously, some means of disposing of this wood, ideally involving recycling, is critically needed.

We are examining two environmentally benign methods of disposing of CCA-treated wood used in residential construction. Both methods attempt to recover as much useful wood, or its components, as possible, thereby reducing the impact of these materials on disposal issues (such as landfill sizes), and both methods can be scaled from the bench to the field. The first method utilizes modified anaerobic (that is, without air) pyrolysis to remove as many of the useful chemicals from the treated wood as possible. The second method involves extraction of the metal components from the wood using supercritical fluid–ionic liquid extraction. This approach, if developed successfully, will allow contaminants to be removed and the wood reused in its entirety.

Objectives

The overall objective of this work is to develop environmentally acceptable techniques for the disposal of chemically treated wood products used in housing. The general philosophy we are employing is to develop methods that will recover as much of the wood (or its components) as possible in order to minimize hazardous waste and maximize reuse of the wood or its components. To accomplish this objective, we are examining two methods. The first assumes that the metals bound to the wood cannot be removed and the only

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means of recovering usable material from the biomass is to extract the chemicals from it directly (that is, we leave the metals behind and generate a reduced mass for disposal). The second approach assumes that the metals can be removed from the wood, thus allowing the wood to be reused in its entirety. The following two objectives are identified as avenues for this research:

Objective 1. To refine the use of anaerobic pyrolysis for recovering useful chemicals from CCA-treated wood.

Objective 2. To investigate the feasibility of extracting residual metals from contaminated wood using ionic liquids in conjunction with supercritical fluids.

Approach

Objective 1. We constructed an anaerobic pyrolysis chamber based on a horizontally oriented Kugelrohr apparatus. This apparatus, which resembles a round-bottom flask housed horizontally in a "coffee pot," is being used to pyrolyze CCA-treated wood samples at a variety of temperatures and atmospheric conditions (for example, under inert gas or vacuum). The Kugelrohr apparatus allows for optimization of the pyrolytic and collection conditions to obtain the highest efficiency of chemical removal.

Objective 2. Carbon dioxide is being used as the principal supercritical extraction fluid and is prepared with a commercially available syringe pump. We are performing extractions at a variety of conditions to optimize the recovery of the CCA components. All supercritical fluid extractions are performed in the dynamic mode. Specific variables being studied include ionic liquid concentration, miscibility and miscibility enhancers for the fluids, and extraction conditions (such as pressure and temperature).

Expected Outcomes

The result of this research will be the development and testing of two chemical methods for recovering CCA-treated wood or its components. We anticipate that these studies will result in the recommendation of strategies for scaling the bench experiments to larger scale, commercial application.

Timeline

Objective 1 will be completed by March 2006.
Objective 2 will be completed by September 2006.

Cooperators

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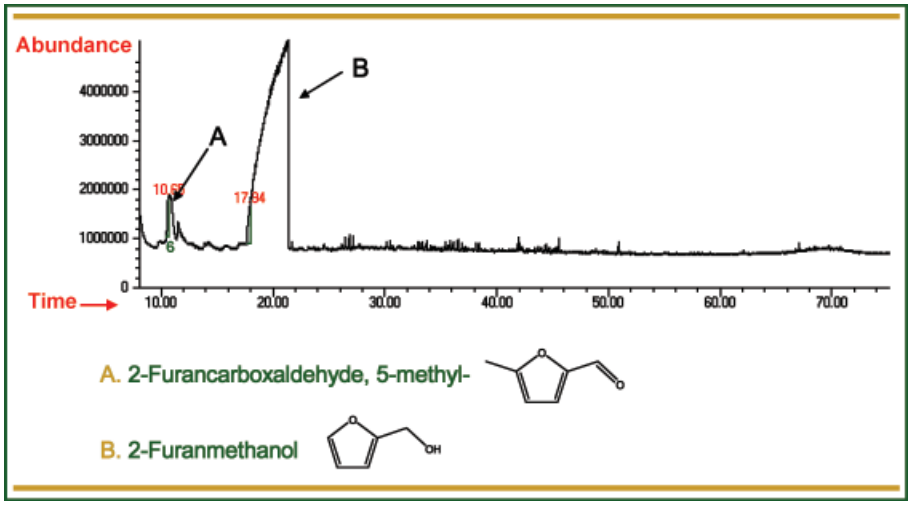

Gas chromatographic/mass spectral identification of CCA-treated pyrolyzed wood products.