A BIOBASED ADHESIVE FOR WOOD PRODUCTS MADE DURING CONSOLIDATED BIOPROCESSING OF BIOMASS TO ETHANOL

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Cellulosic ethanol processes are faced with narrow profit margins due to relatively high feedstock and conversion costs. These processes are expected to produce large amounts of residual solids in the form of microbial cells and incompletely-degraded feedstock. Capture of revenue from this residue is essential for the economic feasibility of cellulosic ethanol. However, no use for such residues has been identified beyond animal feed applications, for which distillers grains already yield an ample supply.

The residues from one cellulosic ethanol platform (fermentation by anaerobic bacteria producing their own cellulolytic enzymes, so-called "consolidated bioprocessing" or CBP) have novel adhesive properties for wood adhesive applications. Such residues can potentially be used as partial or full replacement of certain petroleum-based adhesives (e.g., phenol-formaldehyde, currently used at a level of over one billion pounds per year in the U.S.). CBP, the source of the residue, is projected to be the major second-generation technology for biofuels production, eventually supplanting the fungal cellulase/yeast-based "sugar platform."

Here at the U.S. Dairy Forage Research Center we've developed a process for making a biobased adhesive from residue left over from CBP ethanol production. The adhesive product has been bench tested for plywood production; in blends with phenol-formaldehyde (PF) it can replace up to 30% of the PF currently used in plywood production, and up to 73% when some other forms of cellulose are used. This technology is unique in that it identifies a potential use for a large volume of residue from a process expected to produce the bulk of the biofuels in the future (CBP). This end-use can potentially replace a major industrial chemical (PF) whose source (petroleum) is becoming less available and more expensive, and whose undesirable properties (toxicity, poor shelf life and difficulty in handling) complicate its use.

In order to move forward with this technology, our primary needs are two-fold:

1. Partnering with an entity with sufficient fermentation capacity to produce enough material for testing under manufacturing conditions.
2. Partnering with a wood products manufacturer to test the residue for handling properties and adhesive performance under production conditions.

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