# Ionic liquids from biomass waste could pretreat plants destined for biofuels

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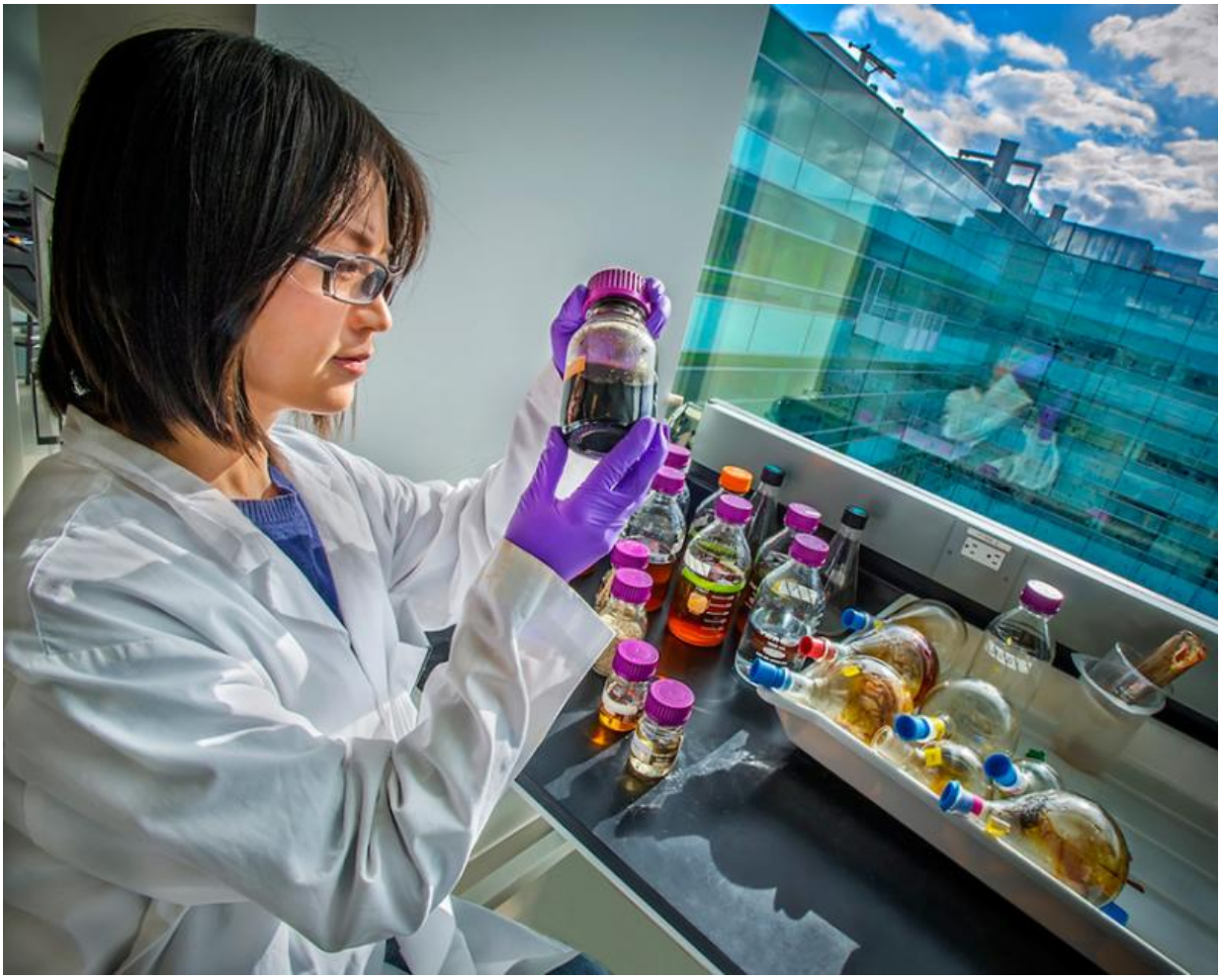

Researchers are exploring the use of ionic liquids as a biomass pretreatment. Credit: U.S. Department of Energy (DOE) Joint BioEnergy Institute

Ionic liquids (ILs) have been shown to be an excellent pretreatment solvent for biomass; the ILs prepare the plant matter to be broken down into its component sugars, which can be used in creating biofuels. However, the availability and high cost of petroleum-derived ILs pose challenges. Synthesizing new ILs directly from biomass "wastes" – the lignin monomers and hemicellulose – is being studied as a new approach.

When the renewable biomass-derived ILs were used to prepare switchgrass biomass, high yields of sugar were generated, comparable with results obtained using conventional ILs. Cost projections of renewable ILs are $4/kg, much lower than the current top-performing ILs, improving the economic viability of biofuels. Thus, deriving ILs from lignocellulosic biomass shows significant potential for creating a "closed-loop" process for future biorefineries and has far-reaching economic impacts for other IL-based conversion technologies currently using ILs synthesized from petroleum sources.

Researchers, led by those from the U.S. Department of Energy Joint BioEnergy Institute, sought to decrease the cost of ILs by synthesizing them directly from the lignin monomers and hemicellulose found in biomass. After synthesizing tertiary amine-based ILs from aromatic aldehydes derived from lignin and hemicellulose, the researchers used molecular modeling to compare IL solvent parameters with the experimentally obtained compositional analysis data. Using powder X-ray diffraction, they also investigated the effectiveness of pretreating biomass with these new switchgrass ILs. The revealed structural changes in cellulose and glycome profiling showed changes in the extractability of hemicellulose epitopes (antigenic determinants).

**More information:** A. M. Socha et al. Efficient biomass pretreatment using ionic liquids derived from lignin and hemicellulose, *Proceedings of the National Academy of Sciences* (2014). DOI: 10.1073/pnas.1405685111

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