Feedstock Agnostic Pretreatment Technology

Seema Singh[1], **Seema Singh**[1*](SSingh@lbl.gov), Kevin George[1], Rohit Arora[1], Chenlin Li[1], Ian Mathews[1], Jay Keasling[1], Taek-Soon Lee[1] and Blake Simmons[1]

[1] Joint BioEnergy Institute, Lawrence Berkeley National Laboratory, Emeryville, CA

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Project Goals:
Development of feedstock agnostic pretreatment technology to support year-round operation on multiple local feedstocks to enable lignocellulosic derived advanced transportation fuel.

Efficient and cost-effective biomass pretreatment remains one of the most significant hurdles towards the realization of biofuels that can displace fossil fuels. Pretreatment represents one of the most significant costs from an operational perspective, and as such, JBEI is developing novel biomass pretreatments to help drive the overall costs of the biorefinery down. One cause of this expense, and limited deployment thus far, for the more common biomass pretreatments (e.g., dilute acids, autohydrolysis, dilute bases, organic solvents, steam explosion, lime) is that they are only effective on a narrow range of the available lignocellulosic feedstocks. For example, while dilute acid and ammonia fiber expansion may be relatively effective in pretreating grasses and corn stovers, they are not that effective in pretreating soft woods and hard woods. Additionally, no pretreatment exists today that is known to efficiently pretreat and liberate sugars from mixed feedstock streams (e.g., hardwoods, softwoods, grasses, and agricultural residues fed simultaneously). Year-round operation on multiple local feedstocks and operations that are not dependent on single feedstock availability and price may partially de-risk lignocellulosic derived transportation fuel. We have previously demonstrated that certain ionic liquids (e.g., 1-ethyl-3-methylimidazolium acetate) are very effective in pretreating a wide range of feedstocks, but have yet to demonstrate that this pretreatment technology can efficiently process mixed feedstocks. In that context, for the first time we have developed and demonstrated that ionic liquids can process a mixed feedstock input. Furthermore, we have demonstrated that the hydrolysates generated from this mixed feedstock are suitable for the production of advanced biofuels and/or biofuel precursors through microbial fermentation. These recent advancements in mixed feedstock processing using ionic liquid may support intercropping of feedstocks resulting in increased energy density per acre.