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Lignin and hemicellulose based ionic liquids as pretreatment solvents for the production of fermentable sugars from switchgrass

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Certain types of ionic liquids (ILs) have shown great solvation power on biomass or some major biomass components, resulting in remarkable efficiency for biomass pretreatment. To date, the best performing IL cations such as imidazolium and cholinium are derived from petroleum or natural gas. ILs derived from inexpensive and renewable reagents are highly desirable. Lignin is earth's most abundant, naturally-occurring aromatic polymer, and replacement of petroleum-based platforms with those derived from lignin represents a virtuous challenge for chemists. Protic ionic liquids prepared from vanillin and furfural have demonstrated efficacy as pretreatment solvents for the production of fermentable sugars from biomass. We herein present the synthesis and evaluation of quaternary benzylammonium ILs synthesized from vanillin and syringaldehyde, two major products of oxidative lignin depolymerization. Reductive amination with dialkylamines (C1-C6) followed by methylation with dimethyl carbonate was used to prepare a series of ILs, which were characterized and evaluated for their ability to pretreat switchgrass. Certain ILs gave excellent pretreatment yields of glucose and xylose after standard enzymatic saccharification.

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