Dushyanthi Hoole, J Bioproces Biotechniq 2016, 6:7(Suppl)
http://dx.doi.org/10.4172/2155-9821.C1.010

A mild and inexpensive depolymerization method towards "cleaner" biofuels, chemicals and materials from corn stover

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The aim of this study was to utilize profitably the excess phytomasses and their AFEX (ammonia fiber expansion) pretreated fermentation residues accumulating in our laboratory (Biomass Conversion Research Laboratory). The ideal process sought was one that was non-crop specific, low-cost, simple and could convert the biomasses to biofuels, chemicals or materials while addressing the relevant concerns namely, that , compared to petroleum, bio-based products are less *"clean"* due to their higher nitrogen content which, upon combustion, produce more nitric oxide- a cause of acid rain; and cost more. This presentation portrays our initial work on the one-pot, 'cleaner" depolymerization reaction on corn stover in which 30-82% of the material was solubilized. The soluble product and the insoluble residue were both fine beige-brown powders. The product comprised polymers and oligomers of which 50% had molecular weights around 1600 Daltons. The carbohydrates present could be precipitated out with brine but were not studied in detail. The aromatic content of the product and residue were dependent on the conditions used (temperature 23-85^{o}C and atmospheric pressure). The comparatively inexpensive acid catalyst used for hydrolysis was generated in situ and is compatible with stainless steel and glass. The excess reagent which served as the solvent was removed under vacuum or decomposed with water and precipitated with hydroxides for regeneration later. The product was dried in air- or under house vacuum. The residue remained similar to corn stover in structure. The relevant data obtained through compositional analysis, FTIR, GPC, ^{1}H NMR and nitrogen analysis will be presented. The product was 63% 'cleaner" than corn stover with respect to the nitrogen. The sulfur, also a catalyst poison, is solubilized by the reaction. This is the first time the issue of *"clean"* biofuels is being addressed in biomass conversion. The above process is elementary and therefore suitable for operation near the corn fields, reducing transportation costs.

Biography

Dushyanthi Hoole did her PhD at Loker Hydrocarbon Institute, University of Southern California. She is currently an Associate Professor at Michigan State University, East Lansing. Besides in organic and analytical chemistry, she has published in the fields of engineering and chemical education, web-based delivery, child rights in conflict situations, and religion and Asian culture. She has received the IIE Award of Outstanding Service "in Helping Advance Humanitarian Causes around the World." Her hobbies include art and poetry.

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