Poster E10

Evaluation of the Critical Fluids to Support Production of Xylo-Oligosaccharides from Miscanthus Giganteus: a Step Towards Integrated Biorefining

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Sustainable renewable energy, particularly liquid transport fuels such as bioethanol and biodiesel represent considerable academic and industrial focus. Lignocellulosic bioethanol also referred to as 2nd generation bioethanol is emerging as consequence of the desire to 1) reduce any potential food vs fuel conflict 2) reduce feedstock cost since lignocellulosic biomass is abundant either through high yielding energy crops or from agri-food residues such as corn stover.

While cellulose is the target feedstock within the ligncellulosic complex for ethanol fermentation the current strategy involves presenting a complex 'soup', the product of 'pretreatment' to the selected yeast strain. However it is widely recognised that pretreatments also generate at least four main classes of fermentation inhibitors: furfural and hydroxymethyl furfural (furans), weak acids, and phenolic compounds. The inhibitors of fermentation are thought to be derived from hemicellulose and lignin.

Our overall goal is to demonstrate the value of adopting the emerging integrated biorefining concept whereby we are able to present purified cellulose from *Miscanthus* χ *giganteus* as a substrate for downstream bioethanol fermentation. Recovering hemicellulose from the lignocellulosic complex would be way of creating additional revenue per tonne. Subcritical water, a 'green' environmentally benign solvent, with and without carbon dioxide as a modifier was our chosen solvent. With aid of Design of experiment and Response surface methodology, we have optimised the process parameters to maximise the yield of high molecular weight hemicellulose. Following the recovery of hemicellulose, and again using subcritical water the polymer was hydrolysed to generate xylo-oligosacharides, which have potential application as prebiotics in the food and feed sectors. Process parameters of subcritical water were optimised with respect the degree of polymerisation and the type and complexity side group substitutions to the xylo-oligo backbone which are thought to play role in the efficacy of prebiotic activity. The cost benefit will be discussed.