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Taguchi Design of Experiments (DOE) for fermentations, pre-treatments and inhibitor studies

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Abstract

A biorefinery is a facility that integrates biomass conversion processes and equipment to produce fuels, chemicals, value added products, feed, materials and energy from biomass. The BEACON biorefinery platform is an innovation lead research project focused on working with businesses to develop new products, processes and methodologies that can deliver on innovation and commercial impact. Processing and conversion of plant biomass presents a variety of opportunities for optimization. Developments in conversion technologies will be part of the challenge e.g. developing new pre-treatment techniques for the direct conversion of plant biomass. At present, there is a need for more efficient and robust techniques that can convert more biomass with less inhibitors. Progress in these areas will enable efficient conversion/ fermentation of plant based substrates into higher value products. We are currently optimizing pre-treatment technologies using Taguchi based design of experiments for oat hulls at pilot scale.

A Taguchi based Design of experiments (DOE) was employed to conduct experiments to investigate the pre-treatment process and optimize the pre-treatment conditions. The Analysis of Variance (ANOVA) was carried out to detect the optimal level and to understand individual and interactive effects of each factor on pre-treatment. Pre-treatments based on two-step steam explosion combined with an intermediate separation were employed to reduce inhibitor content. This two-step steam explosion reduces the inhibitor content, promotes the fermentation of lignocellulose, and simplifies the process of excluding the detoxification steps

Biography

Dr. Sreenivas Rao Ravella has completed his PhD in microbiology from Osmania University and postdoctoral studies from Centre for Cellular and Molecular Biology (CCMB), Hyderabad, India. He is a senior fermentation scientist at Institute of Biological and Environmental Rural Sciences (IBERS), a premier research organization in UK. He has published more than 40 papers in reputed journals and has been serving as a reviewer for several scientific journals.