Biological pretreatment of lignocellulosic material for increased biogas production by anaerobic digestion

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Without pretreatment, anaerobic digestion of lignocellulosic material typically converts only one-third of the carbon into biogas which is typically only 60% methane. Physical and chemical pretreatments to increase biogas production from biomass have proven to be uneconomical. The anaerobic thermophile, Caldicellulosiruptor bescii, has been shown to be capable of solubilizing up to 90% of lignocellulose, thus making the carbon accessible for anaerobic digestion. Preliminary experiments show C. bescii is capable of solubilizing a wide range of lignocellulosic materials. Anaerobic digestion readily and rapidly converts the soluble products into biogas with 70-80% methane. Isothermal microbiocalorimetry measurements have provided a thermodynamic understanding of the process. We have applied the pretreatment/anaerobic digestion process to giant king grass, corn mash, corn stover, waste activated sludge (WAS), almond shells and algae and found the biogas yield significantly improved. Results from experiments conducted using isothermal microbiocalorimetry as well as larger-scale 30L and 60L reactor pretreatment/anaerobic digestion experiments will be presented

Speaker Biography

Jaron C Hansen is a Professor of Chemistry and Biochemistry at Brigham Young University (Provo, Utah, USA) and Co-founder of Verde and Anaerobic Digestion Technologies (AD Tec). His research involves improving the understanding of atmospheric and environmental chemical processes through focused laboratory, field and computational studies as well as the development of improved anaerobic digestion methods for enhanced production of biogas and for degradation of waste substrates.

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