Lew P Christopher, J Fundam Renewable Energy Appl 2016, 6:3(Suppl)
http://dx.doi.org/10.4172/2090-4541.C1.007

World Bioenergy Congress and Expo

June 13-14, 2016 Rome, Italy

Lew P Christopher

Lakehead University, Canada

Consolidated bioprocessing of lignocellulosic materials for cost-competitive bioenergy production

Hydrogen (H_2) is considered the "energy of the future" due to its high energy content (143 MJ/Kg) which is 5.3-fold and 3.3-fold higher than that of ethanol and gasoline, respectively, and non-polluting nature, with water as the only product. An environmentally-friendly alternative to the current H_2 commercial production via steam reforming of methane is presented through microbial fermentation of simple sugars. However, production processes based on glucose is not considered cost-competitive as the market price of glucose ($440-600/MT) is approximately 10-fold higher than the cost of lignocellulosics ($39-60/MT). Furthermore, the current cost of lignocellulose conversion to bioenergy (US $15-$25/GJ) exceeds the cost of fossil fuels (US $3.31-$17.37/GJ). A feasible, large-scale production of bio-H_2 would require the development of advanced production processes such as Consolidated Bioprocessing (CBP). CBP has been proposed as the ultimate industrial configuration for cost-efficient hydrolysis and fermentation of lignocellulosic biomass. It was demonstrated that the extreme thermophile *Caldicellulosiruptor saccharolyticus* was able to ferment switchgrass to H_2 in one step without any physicochemical or biological pretreatment, whereas H_2 production from glucose reached the theoretical maximum for dark fermentation of 4 molH_2/molglucose. As pretreatment is the single most cost-intensive processing step in biomass bioconversion (25% of total costs on average), combining four processing steps (biomass pretreatment, enzyme production, biomass hydrolysis, biomass fermentation) into a single biorefinery operation makes C. *saccharolyticus* a promising CBP candidate for sustainable production of H_2. The advantages of CBP, thermophiles and low-cost lignocellulosic feedstock for bioenergy production will be reviewed and discussed.

Biography

Lew P Christopher holds a Master's degree in Chemical Engineering and a PhD degree in Biotechnology. He has more than 25 years of industrial and academic experience in the field of industrial biotechnology and bioprocessing of lignocellulosic biomass. He has worked as industrial research scientist and held faculty positions in departments of biotechnology, chemical and biological engineering, and environmental engineering in South Africa and USA. Currently, he serves as Director of the Biorefining Research Institute leading an interdisciplinary team of faculty and researchers from several science and engineering departments at Lakehead University in Canada. His research mission is to add value to the global Bioeconomy by applying an integrated biorefinery approach to the development of renewable bioenergy technologies. He is a member of the Editorial Board of several international biotechnology journals, advisory boards, and professional societies. He has made over 400 scientific contributions to the field of Biomass Biorefining including 8 patents, 4 books, and over 50 invited lectures delivered in Africa, Asia, Europe, North and South America.

lchristo@lakeheadu.ca