

Title: Lignocellulose-Centered Biofuels in the 21st Century: Challenges and Opportunities to China and the world

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Abstract

The global energy system currently relies mainly on hydrocarbons such as oil, gas and coal, which together provide nearly 80 % of energy resources. It has been reported that the world primary energy demand will grow by 1.6% each year on average during next two decades; and China, if together with India, account for just over half of that increase. In line with the requirements for sustainable economics and clean environments, biofuels have recently received tremendous attention both in industry and academic communities worldwide. Today, bioethanol and biodiesel are predominantly produced from corn kernels, sugarcane or soybean oil. But researchers and investors are increasingly upbeat about another biofuel feedstock, lignocellulose--the most abundant biological material on the earth. Despite the surging popularity of bioethanol and biodiesel as transportation alternatives, both have barely put a dent in our use of oil. However, alternative and renewable biofuels derived from lignocellulosic biomass, the so-called second generation of biofuels, offer the biggest potential to reduce our dependence on fossil fuels and mitigate global climate change, which has been indeed put in the center stage of biofuel development in the 21st century.

In practice, the current state of technology with respect to biomass conversion is still far away from being mature for a large scale application due to its efficiency and processing economics. Recent studies on the utilization of termites or other bioconversion systems may offer a possible option for realizing biomass conversion in an efficient and economical way. This review addresses various lignocellulolytic systems, their potential values, challenges, and opportunities that exist for scientists and industries to advance the biofuel technology, where the following topics will be further addressed: 1) Scientific and industrial potentials of the natural biomass utilization systems; 2) Novel biocatalysts explored from natural biomass utilization systems and their engineering potential for industrial uses; 3) Novel microbial symbionts discovered from natural biomass utilization systems by “omics” technologies; 4) Bioreactor innovations mimicked and advanced from the efficient biomass utilization systems. With this overview, I hope that you can sense the excitement of the scientific endeavors both from China and the rest of world to crack the hard nut in developing lignocellulosic biofuels--that will certainly be centered in the 21st century as one of the primary renewable energies in the world.

Biography

Jianzhong Sun, Ph.D., male, Vice Dean of School of the Environment in Jiangsu University, obtained his Ph.D. from Louisiana State University, USA in 2002. He has ever worked as a faculty member in Mississippi State University from 2004-2009. In 2009, he jointed to Jiangsu University and served as a director of Biofuels Institute in Jiangsu University and same time he also served as an adjunct professor in Dept. of Biological Systems Engineering at Washington State University, USA. As a founder of this institute, his research team intends to provide up-to-date and revolutionary technologies via “bioprocessing mimicking” for cost effective and competitive biofuels production using biological pathways. The highlights of his research agenda are currently focused on improving the conversion efficiency of biomass by modifying plant cell wall structures and its compositions, as well as the exogenous lignocellulolytic gene expressions for the dedicated energy crops. For further information, please contact at **E-mail:** jzsun1002@hotmail.com or jzsun1002@ujs.edu.cn