Production of Second-Generation Biofuels

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Lignocellulosic biomass like corn stover and wheat straw is nowadays treated as waste/agricultural residue. Like many other substances that were treated as waste up until recently, this biomass is gaining potential as a feedstock for the so-called 2nd generation biorefineries. These new generation biorefineries will not use regular sugar and starch like the current 1st generation biorefineries, but will be able to break down biomass into C5 and C6 sugars and convert these into chemicals, i.e., ethanol.

The advantages are obvious: no competition with the human food chain, cheap and renewable natural biological resources for the production of bioenergy, biofuels and bio-based products via biorefining. As such, lignocellulosic biomass and biorefineries will contribute to the sustainable development of human civilization in the 21st century.

Scientists and engineers from industry, universities and research institutes work together to create the most sustainable and cost effective processes for the hydrolysis and fermentation of lignocellulosic biomass. Only a fully integrated design, construction and operation of a biorefinery will make it sustainable and cost effective, when producing fermentable sugars and biofuels such as ethanol. In this way many value added features can be realized, like improved (cellulosic) ethanol yields, lower operational and capital costs and an improved eco-footprint.

This presentation will detail the need of 2nd generation biofuels as the logical and essential follow-up of the existing 1st generation biofuels. An outline of the typical 2nd generation biofuel production process will be given, as well as an overview of technologies in development to pretreat and hydrolyze biomass using enzymes in order to convert it to sugars which can successively be fermented to ethanol. Examples will be given of 2nd generation pilot and demonstration plants under construction or in operation in both Europe and the US.

Special attention will be given to the concept of the integrated biorefinery in which partners collaborate with their technologies and multiple products are produced. It will highlight both the direct challenges to mature the technology and indirect to effectively realize it, such as logistics, finance and legislation for second-generation biofuels to become a viable alternative.