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Second-generation biofuels and bio-products: an overview of recent projects at IFPEN

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Second-generation biofuels produced from lignocellulosic biomass (forest residues, straw, high yield crops, ⋯) are now one of the main technological options for reducing the climatic impacts imposed by fuels used in transportation. Two main types of process are used to convert lignocellulosic biomass into biofuels: biochemical and thermochemical processes. Today the main product from the biochemical route is known as 'cellulosic ethanol', produced from hydrolysis of polysaccharides and fermentation of extracted sugars. In the thermochemical processes, the initial structure of lignocellulosic solid matrix is broken down by gasification (BtL process) to produce a synthesis gas which can be converted by Fischer-Tropsch synthesis, after purification, into very high quality biodiesel and biokerosene. Bio-liquids can be also produced from other thermal treatments such as fast pyrolysis or hydroconversion. The choice of biomass valorization process depends on the characteristics of the input biomass, its availability and the type of output fuel required. Production of bio-based chemical intermediates using lignocellulosic resources is another major topic issue to deal with, in response to the need to find sustainable alternative sourcing channels for petrochemical intermediates (ethylene, propylene, etc.). A real opportunity exists to further develop a new chemical industry based on processing non-food biomass.

Lignocellulosic transformation in biofuels or platform biomolecules is performed by multi-steps processes and involves complex chemical reaction pathways. The resulting aqueous or organic solutions are composed of a large diversity of oxygenated compounds (i.e. alcohols, sugars, carboxylic acids, carbonyls and phenols) whose characterization is essential to assist conversion reactions. Relevant analytical methodologies based on sample pretreatment and complementary chromatographic techniques are required to provide a detailed description of the chemical composition of these oxygenated matrices.

This presentation provides an overview of some recent projects and studies in which IFP Energies nouvelles is involved to produce 2G biofuels and bio-products. A special attention will be paid on the products quality from a technical point of view, showing that analytical characterization of biomass derived liquids is a key point to get a better knowledge of their chemical composition and in this way to contribute on developing new processes for biomass transformation.

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