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Thermo-Biorrefineries: A promising concept for production of bio-electricity, 2nd generation ethanol and renewable chemicals in Portugal

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Bioelectricity production from woody wastes has been pointed out as a promising way to mitigate risks of fire incidence and propagation within forest plantations in Portugal along the most dry and hot periods of the year. Nevertheless, consistent price reductions resulting from the increasing availability of electricity, including cheaper sources such as solar energy has limited the economic feasibility of small and medium-scale thermo-electricity (only) units in Portugal. In this scenario, the adoption of a biorrefinery concept has emerged as an interesting alternative to improve and increase the economic envoltory of the biomass-to-electricity activity. Additionally to the bio-electricity itself as product, a biorefinery constituted by integrated plants and processes deliveries multiple products from lignocellulosic biomasses, thus making feasible the economic exploitation of a myriad of low-value agrondustrial wastes. In principle, different biomass components can be converted into sugars and other carbon-rich products, which in turn can be transformed into high-valued chemical products and high-volume biofuels, while generating bio-electricity and process heat for self-consumption and commercialization. In this scenario, the high-value products enhance profitability, the high-volume fuels contribute to support energy needs and the power production reduces costs while avoiding greenhouse gas emissions. Hence, the biorefinery concept envisages the maximization of the energy-value derived from the biomass feedstock at minimal impact to the environment. This paper describes the concept, technologies and economics related to the Thermo-Biorrefineries (TBR), which are integrated plants that produce bio-electricity, second-generation ethanol and chemicals using low-cost and abundant lignocellulosic biomasses such as eucalyptus wastes as feedstocks. The mentioned Thermo-Biorefinery (TBR) concept has been built on two different biomass-to-products platforms. Basically, the "sugar platform" is based on chemical and biochemical conversion processes, particularly the fermentation of C_5-sugars extracted from the hemicelluloses, while the "carbon platform" is based on the thermal conversion of the cellulignin fractions into bio-electricity and other valuable products.

Biography

Henrique Baudel has completed his PhD in Environmental Sciences from University of Concepción (Chile), Chemical Engineering from Federal University of Pernambuco (Brazil) and Postdoctoral studies from Lund University (Sweden). He works as P&D and Technology director of America Biomass Technologies, a premier chem and biotech company. His publications reach more than 50 works including papers in journals and proceedings, patents and specialised technical reports. He has been working as supervisor of research works at both academia and industry, as well as serving as reviewer and editorial board member of repute.

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