# Integral Valorization of Biomass as the key for Sustainable Biorefineries

Adriano V. Ensinas

UFABC, Brazil

The green economy is growing as alternative to traditional fuels and chemicals markets based on fossil carbon conversion technologies. Its full implementation will allow producing organic products in large scale based on the principle of photosynthesis, like a huge recycling device able to recover carbon from the atmosphere and make it available for the society.

The biorefinery concept allows multiple use of “green carbon” present in biomass, bringing flexibility to a system that is able to produce green energy and several biobased products. Local and global markets for biorefineries are being created worldwide but sustainable growth of this industry requires cost-effective products and energy-efficient plants that can reduce effective greenhouse gases emissions in a carbon neutral loop.

The development of novel products from biorefineries usually focus the conversion of only some parts of the biomass composition and selection of pathways that can leads to the maximum reaction yield. This approach is useful for starting the learning process of new technologies but in further steps, an integral process design approach is needed, which can allow engineers to tackle the problem of industrial utilities integration, mass recovery and waste treatment.

Throughout a biorefinery process, frequently, precious amount of valuable carbon fixed by photosynthetic process is lost when a waste stream is released from the biorefinery process. Furthermore, heat produced in exothermic reactions and heat transfer processes are big contributors for plant inefficiency. Hence, an integral use of biomass, with valorization of carbon and energy available in the conversion process, is crucial for the feasibility of a biorefinery.

In this presentation, the concept of integral valorization of biomass will be discussed with the help of some biorefinery case studies. Importance of integrated technologies for finding cost competitive and energy-efficient biorefinery plants will be shown using computer aided methods for modelling and process design optimization.