Session Title: Biomass Conversion

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Biomass is considered to be a renewable source for production of both energy and industrial chemicals, and has potential to meet the global fuel and material needs in a sustainable manner while greatly reducing greenhouse gas footprint. A wide array of biomass feedstocks, ranging from forest or agricultural residues such as corn stover or wheat straws to dedicated energy crops such as switchgrass or miscanthus, can be used to generate heat, electricity or chemical products including biofuels by thermo-chemical or bio-chemical conversion.

The first generation biofuels or chemical products, produced primarily from food crops such as corn, sugar, vegetable oils or others, are made with relatively simple technologies that are well-developed and cost-effective for large scale applications. Although such products use plant material that is a renewable source, their sustainable production is debated because of the possibility of undue competition with food supply chain, use of resources such as water or cultivated land, and ability to achieve targets for substituting petroleum-based products or reducing greenhouse gases. Most of these concerns can be addressed in the second generation biofuels or chemical products that are produced from non-edible feedstocks such as woody or fibrous lignocellulosic biomass. However, useful biomass components (for example, sugars) are locked in complex polymeric chains of cellulose, hemi-cellulose and lignin. It requires complicated and unproven technologies to extract the useful components by thermal conversion, gasification, algae growth or enzymatic hydrolysis followed by fermentation. All these processes are summarized now-a-days under the term biorefinery, which can be considered as an analogous concept to a conventional petroleum based refinery, where the biomass raw material (as opposed to petroleum) is used as feedstock to produce various fuels and products. However, the cost of conversion processes remain high, and several technological breakthroughs are needed to reduce costs as well as technical uncertainties. Also, there are logistical challenges to reach its full potential because of lack of supply chain to collect, store and transport large-scale biomass to production facilities or competing use of water and land resources. These challenges can be mitigated by development of centralized and decentalized feedstock supply chains or use of non-agricultural land for cultivating energy crops.

This session will provide an overview of some of the advanced conversion technologies and research areas, the social and environmental impact of biomass cultivation and conversion, the impact of government policies and regulations, as well as the technical, logistical and commercialization challenges involved in making the bio-based economy a reality.