Data-driven biowaste Valorization Processes for Biochemicals and Biofuels

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A sustainable society requires efficient utilization of limited resources and energies. The major challenges associated with existing sustainable technology mainly exist in their expensive raw materials, energy-intensive processes, and non-competitive products. To tackle these challenges, my research focuses on the use of green chemistry and engineering techniques to transform abundant and low-cost biowaste into value-added bioproducts including platform chemicals, functional biomaterials, and biofuels. In this talk, we will summarize how we explore new synthesis and reaction mechanisms, and innovative bioprocess design approaches to add value for bioproducts from renewable materials (mainly biowaste). The talk will describe the data-driven biowaste valorization process for biochemicals and biofuels. From the chemical viewpoint, we designed new catalysts that can improve the selectivity and yield of the lignin-depolymerized products. From the data-driven viewpoint, we implemented data-driven tools such as reinforcement learning algorithms to achieve the optimized anaerobic digestion process under feedstock uncertainty control. This model will allow for an alternative automated control system for this delicate process, ensuring stability in the reactor under different feedstock uncertainty. Ultimately, optimizing biomass/biowaste valorization processes that can help mitigate the carbon crisis is essential for a sustainable future.