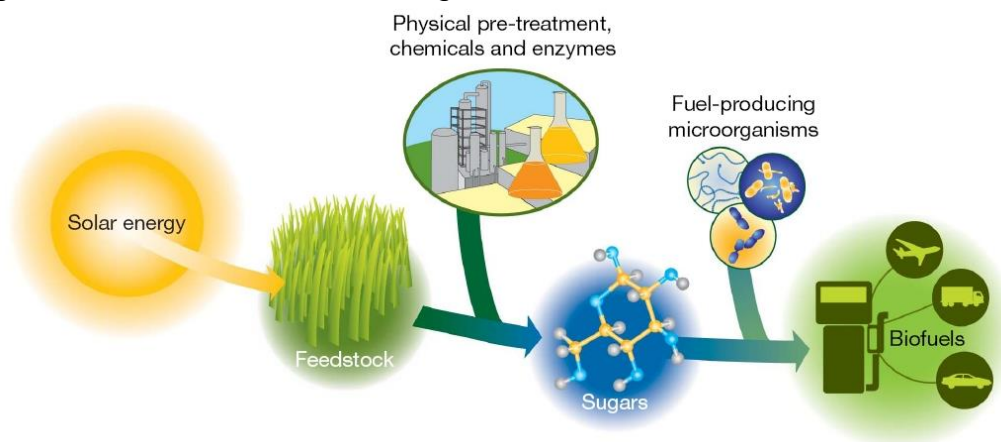


Advanced Biofuels Development from Renewable Biomass – Professor Maobing Tu, Department of Chemical and Environmental Engineering, tumg@uc.edu

Developing alternative biofuels from renewable biomass has great potential to reduce U.S. dependence on foreign oil while improving national energy security and addressing the environmental issues. The Renewable Fuel Standard mandates 36 billion gallons of biofuels should be produced annually by 2022, with 16 billion gallons coming from lignocellulosic biomass. Although ethanol has been the main candidate of transportation biofuels, butanol has several advantages over ethanol including low vapor pressure and tolerance to water contamination. Butanol is one of the promising advanced biofuels being pursued by the DOE, NSF and USDA for the next generation of alternative fuels. However, one of the major bottlenecks impeding production of viable biofuels from renewable biomass is the lack of cost-effective processes for converting biomass into biofuels including butanol.



Biomass pretreatment is needed to break down the recalcitrant structure of the plant cell wall for subsequent enzymatic hydrolysis and fermentation. However, the pretreatment processes generate inhibitors from the degradation of cellulose, hemicellulose, lignin and extractives, many of which significantly reduce the microbial growth and fermentation productivity during the fermentation process. Detoxification or conditioning methods are required to reduce the toxicity of hydrolysates for biofuels fermentation, but they increase the total production cost significantly. Progress has been made in the identification of hydrolysates inhibitors. However, the compounds identified to date cannot account for the inhibition level in real biomass hydrolysates and the most potent inhibitors remain elusive. Therefore, there is a critical need to better understand the chemistry of biomass-derived inhibitors with new approaches in the bioconversion processes. The protégé students will work on biomass pretreatment, enzymatic hydrolysis and butanol fermentation.