

Setting the Stage for Biofuels

Crude Oil



Petroleum Refinery

Fuels

Aviation Fuel
Kerosene
Gasoline
Fuel Oil

Petrochemicals

Olefins and **Aromatics** for
polymers, resins, adhesives,
detergents, fibers, lubricants

Biomass



Bio-Refinery

Bio-fuels

Ethanol, Butanol
branched chain alcohols

**Value added
Bio-chemicals**

***Prof. Kris Prather**
Associate Professor of
Chemical Engineering, MIT*

Challenges and Opportunities

Diverse Inputs

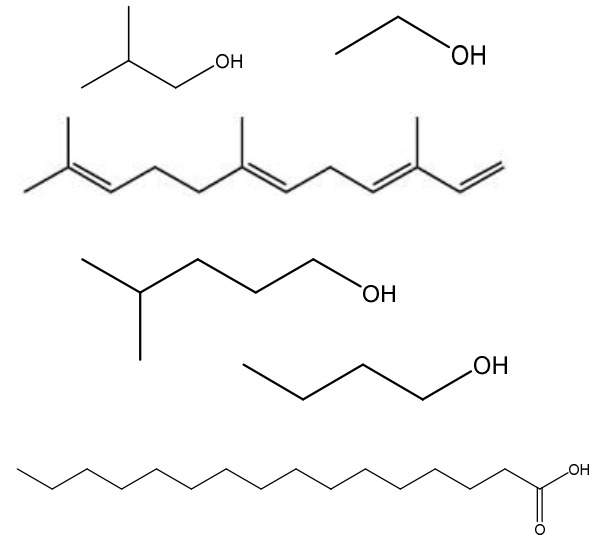


Renewable Sugars



Syn Gas

Diverse Outputs



Logistics – managing feedstock production, collection, and distribution

Rural development – distributed nature of biomass promotes local economic development

Scale – deploying biomanufacturing at sufficient capacity and productivity

Market – competition with petroleum-based products

Novel products – diverse products can be generated through metabolic engineering/catalytic conversion