TWO AND THREE CARBON BIO-BUILDING BLOCKS FOR FUEL AND CHEMICAL PRODUCTION

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Foreign imports now surpass domestic crude oil production, leaving US energy security and independence in question. Alternative sources of carbon, such as biomass, represent a viable, independent source of energy, transportation fuels and chemical products. In fact, the US is projected to have the ability to produce a billion tons of biomass for the bioproducts and bioenergy industries within the next six years. The ability to harness this vast resource, however, is reliant on developing technologies (chemistry) that can efficiently convert these raw feedstocks to usable fuels and chemicals. Additionally, in order for biofuels to be cost competitive with their petroleum counterparts, pathways for the co-production of chemicals must be employed to offset production costs of inherently low-value fuels. We have therefore targeted strategies to efficiently co-produce molecules which (1) display promising fuel properties and (2) are employed in industrial settings. This presentation will highlight our recent efforts in developing selective catalytic routes for synthesizing potential fuel molecules and industrially relevant chemicals from acetone and acetaldehyde, which can be produced either directly via microbial fermentation of biomass hydrolysates or through dehydrogenation reactions of bio-alcohols. The emphasis of the presentation will be on the development of reaction conditions for upgrading, the fuel properties of the resulting products and industrial utility of the co-products.