Mono-Ether and Alcohol Bioblendstocks to Reduce the Fuel Penalty of Mixing Controlled Compression Ignition Engine Aftertreatment

Goals

Optimize composition of a diesel bioblendstock with >50% reduction in greenhouse gas emissions relative to conventional diesel fuel. Bioblendstock blended with #2 diesel fuel at >5 vol. % will:

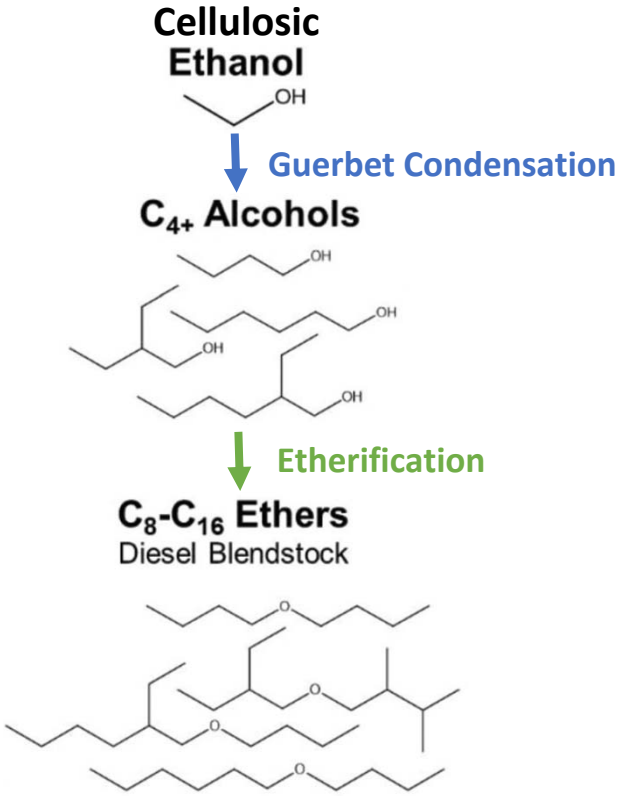
- reduce soot mass emissions by >25%, increase the cetane number, and reduce the pour point and cloud point temperatures
- reduce the fuel energy penalty of operating MCCI engine aftertreatment resulting in a >1% improvement in system energy efficiency
- meet ASTM D975 diesel fuel specifications

Approach

This project will integrate the knowledge derived from catalytic production studies, engine experiments, fuel properties testing and modeling, and technoeconomic and life-cycle analysis to optimize and demonstrate C8+ bioblendstocks produced from cellulosic ethanol via Guerbet condensation of ethanol to higher alcohols followed by etherification to generate C8+ mono-ethers. Fuel property modeling and engine-system modeling will be used in conjunction with process systems engineering and technoeconomic and life-cycle analysis to determine the best bioblendstock and the optimal blend percentage with #2 diesel fuel.

Potential Impact on Co-Optima Goals

The proposed work will directly address the Co-Optima goal of co-development of fuels and engines by demonstrating improvements in engine efficiency and emissions, as well as, green house gas reductions that can be achieved through co-optimization of bioblendstock production and engine operation for mixing controlled compression ignition (MCCI) engines. In that process the project will also address the Co-Optima goal of identifying promising bioblendstocks that decrease criteria pollutant emissions in MCCI engines while also improving fuel properties.



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