# Combustion Chemistry of ADVANCED BIOFUELS

## Dr. Brandon Rotavera
### University of Georgia

Dr. Brandon Rotavera is an assistant professor at the University of Georgia, with appointments in the College of Engineering and the Department of Chemistry. Prior to his current position, Dr. Rotavera was a Postdoctoral Appointee in the Chemistry Department at the Combustion Research Facility of Sandia National Laboratories and a Research Affiliate at Lawrence Berkeley National Laboratory. He earned his Ph.D. in Interdisciplinary Engineering, focusing on Mechanical Engineering and Physical Chemistry, from Texas A&M University in 2012, during which he was a Research Scholar at Centre National de la Recherche Scientifique (CNRS) in Orléans, France, working at the Institute of Combustion, Aerothermodynamics, and Environmental Chemistry. While at Texas A&M, Rotavera studied in the Turbomachinery Laboratory under Dr. Eric Petersen. Dr. Rotavera's research efforts focus primarily on revealing key insight into the fundamental reaction mechanisms of hydrocarbons and advanced biofuels that are relevant for developing numerical models used for the design of fuel-flexible combustion strategies.

## 4 p.m. Monday, April 23

### Mechanical Engineering Office Building (MEOB) 301

Because the production technologies of renewable transportation fuels are advancing, the automotive biofuels of tomorrow will look very different than those of today. While ethanol and biodiesel are currently the primary biofuels in use, and are important to the broader picture of sustainable transportation energy, blending walls limit the impact on petroleum-derived fuel consumption. An important key to biofuels claiming a major role in the transportation sector is production from low-value, non-consumable biomass such as cellulose, hemicellulose, and lignin – the primary components of plant cell walls. These advanced biofuels differ in molecular structure to gasoline, diesel, and aviation fuels, which causes an alteration in the combustion physics governing ignition, heat release, and pollutant formation when used at various blend levels. The fundamental science of these effects remains largely unknown, yet is critical to the development of simulation software needed for designing next-generation fuel-flexible engines.

Concurrent with the changing biofuel landscape are engine strategies trending towards low-temperature, high-pressure operation in order to reduce emissions and increase efficiency. To an even greater degree than in conventional engines, the design of these strategies relies heavily on understanding and quantitatively modeling the reaction mechanisms and chemical kinetics of hydroperoxyalkyl radicals (QOOH) that ultimately govern fuel reactivity.

Accordingly, the seminar will focus on a programmatic framework carried out at the Combustion and Atmospheric Reaction Mechanisms Laboratory (CARMeL) at the University of Georgia, which is designed to answer outstanding questions concerning reaction mechanisms of QOOH radicals derived from advanced biofuels. Detailed examples will be given to emphasize the links between fuel structure, which varies widely among biofuels, and an important engine-design parameter: autoignition delay times.

TEES
TURBOMACHINERY LABORATORY
TEXAS A&M ENGINEERING EXPERIMENT STATION

TEXAS A&M UNIVERSITY

more at turbolab.tamu.edu