COMBUSTION WEBINAR

The Roles of Chemical Kinetics of Liquid Fuels on Near-Limit Combustion Behaviors

Speaker: Sang Hee Won, University of South Carolina

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Biography: Dr. Sang Hee Won is an associate Professor in the Department of Mechanical Engineering at University of South Carolina (UofSC). Dr. Won received his Ph.D. from Seoul National University in 2004. Prior to his academic appointment in 2016, Dr. Won contributed multiple research projects at Princeton University, in the areas of surrogate modeling development, experimental characterization, detailed and reduced kinetic model development, screening methods for petroleum-derived and alternative jet fuels, bio-fuel kinetics, plasma-assisted combustion. At UofSC, he has continued working on jet fuel combustion-related topics (with particular emphasis on near-limit flame dynamics), including experimental studies on the characterization of fuel chemical and physical properties and their impacts on near-limit combustion behaviors.

Abstract: Recent development of advanced engines has been targeting for fuel flexibility, high efficiency, and low pollutant emission, consequently operating the engines at near-limit conditions of combustion process at high pressure and low temperature, where the combustion process becomes more sensitive to fuel physical and chemical properties. However, technical challenges still remain for comprehensive understanding of real fuel combustion, due to the physical and chemical complexities associated with real fuels. In this talk, the distinctive chemical kinetic behaviors of liquid transportation fuels and the chemical functional group approaches through Nuclear Magnetic Resonance (NMR) spectroscopy to characterize their chemical kinetic reactivities will be discussed first, particularly considering the preferential vaporization potentials of liquid fuels. Experimental efforts regarding the preferential vaporization impacts on lean blow out (LBO) and flame flashback will be discussed, where the impacts of fuel chemical property variation along the distillation characteristics of petroleum-derived and alternative fuels are found to be significant for near-limit combustion behaviors.

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