Boulder Fluid and Thermal Sciences Seminar Series

Tuesday, January 16, 2017
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center
University of Colorado, Boulder

Fuel Design for Future Engines

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The fuel landscape has steadily been changing and is expected to evolve at a much rapid pace over the coming years. There will be a shift towards low-grade fuels for power generation and transportation. Additionally, biofuels will see increased usage in the form of blending components to conventional fuels for achieving superior performance. Global warming, increasingly stringent emission regulations, and depleting fossil fuel resources are driving the design of combustion systems towards extreme operating conditions. Ultra-lean fuel mixtures, very high pressures, and low-temperature combustion are some of the directions being pursued currently. In such domains, fuel chemistry and reaction kinetics play critical role in the design and optimization of engines and turbines.

This talk will describe the work being carried out at KAUST to formulate surrogate mixtures for gasoline, naphtha, diesel and other complex blends. Shock tube and rapid compression machine are used as homogeneous reactors to measure fuel reactivity and ignition behavior. These are coupled with sensitive laser diagnostics to probe elementary fuel chemistry. The talk will provide guidelines for the needed complexity in the surrogate mixture to emulate chemical and physical characteristics of the real fuel. Some interesting ignition phenomena, such as pre-ignition and three-stage ignition will also be discussed.

Biography: Dr. Aamir Farooq joined KAUST (King Abdullah University of Science and Technology) in 2010 after earning his MS and PhD degrees in Mechanical Engineering from Stanford University. Professor Farooq's research interests are in the areas of energy systems, fuel formulation and laser-based sensors. His research group focuses on high-temperature infrared spectroscopy, novel quantum-cascade laser sensors, and chemical kinetics of future fuels. He has published nearly 100 archival papers in premier journals related to optics, sensors, fuels, energy and combustion. He has given several invited talks at international conferences and has organized technical sessions and workshops.

KAUST Chemical Kinetics and Laser Sensors Laboratory. https://kinetics.kaust.edu.sa/Pages/Home.aspx