



El Grupo de Ciencia y Tecnología del Gas y Uso Racional de la Energía  
invita al Seminario:

## Sensitive Diagnostics and Chemical Kinetics of Future Fuels

**Conferencista: Professor Aamir Farooq**  
**King Abdullah University of Science and Technology – KAUST (Arabia Saudita)**



Aamir Farooq es Profesor Asociado en KAUST y realiza investigación en sistemas energéticos, formulación de combustibles y sensores basados en técnicas láser. En esta conferencia abordará los últimos desarrollos para la determinación de temperatura de gases y la detección de especies químicas como acetileno, etileno, peróxido de hidrógeno, hidroxilo y electrones libres.

Lugar: Edificio de Extensión de la Universidad de Antioquia, Auditorio 1, Segundo piso

Fecha: Marzo 15 de 2017

Hora: 11:00 a.m.



## Sensitive Diagnostics and Chemical Kinetics of Future Fuels



KAUST Chemical Kinetics and Laser Sensors Laboratory.

<https://kinetics.kaust.edu.sa/Pages/Home.aspx>

### Abstract:

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 higher performance. Many of these transformations are driven by the grand challenge of ‘global warming’ that our planet faces today. Increasingly stringent emission regulations, global warming, 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 combustion systems.

Common facilities for the study of homogeneous chemical kinetics include shock tubes, rapid compression machines, combustion bombs, flow reactors, well-stirred reactors, and motored engines. Of these, shock tubes provide the most ideal environment to investigate fuel chemistry in the absence of heat transfer and fluid dynamic effects. Shock tubes are generally used to measure ignition delay times of fuel/oxidizer mixtures under varying conditions of temperature, pressure, and stoichiometry. However, when coupled with in-situ sensitive diagnostics, shock tubes can provide measurements of reaction rate coefficients and species time-history profiles. Such data are extremely useful in the development and validation of detailed chemical kinetic models.

This talk will feature some latest diagnostic developments for sensitive detection of gas temperature and important chemical species, such as acetylene, ethylene, hydrogen peroxide, hydroxyl radical and free electrons. Advanced optical strategies, such as intrapulse chirping, wavelength modulation, cavity ringdown and microwave interferometry are employed. It will be demonstrated how the application of these diagnostics enables deeper insights into complex reaction mechanisms of future fuels.



**Professor  
Aamir Farooq**

### Short Biography

Dr. Aamir Farooq joined KAUST in 2010 after earning his MS and PhD degrees in Mechanical Engineering from Stanford University, USA. Professor Farooq’s research interests are in the areas of energy systems, fuel formulation and laser-based sensors. Dr. Farooq and his research group focus on high-temperature infrared spectroscopy of hydrocarbons, novel quantum-cascade laser-based sensors, and chemical kinetics of fuel formulation. He has published over 80 archival papers in premier journals related to optics, lasers, sensors, fuels, energy and combustion. He has given several invited talks at leading international conferences and has organized technical sessions and workshops.