Toward the development of predictive capability of combustion phenomena for transport fuels

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One of the near-term solutions for the energy and environmental issues is to increase the efficiency and to reduce emissions in combustion systems. The understanding of combustion science has progressed significantly during the last 30 years thanks to the advances in kinetics modeling, laser-based experimental techniques and computational capability. Combined efforts in these three areas could advance the predictive capability of combustion phenomena in internal combustion engines.

In advanced spark-ignition and compression ignition engines together with newly developing low temperature combustion engines, it is important to understand autoignition behavior and emission characteristics, especially particulate matters/soot of transportation fuels. Autoignition is an ignition mode of diesel engines and is an efficiency limiting factor for gasoline engines and a controlling factor for low temperature concept engines such as premixed-charge compression ignition (PCCI) engines. Soot formation is one of the most complex phenomena involving gas-phase kinetics, particle inception, surface growth, aerosol dynamics and oxidation involving various chemical species. CCRC in KAUST is conducting FUELCOM program supported by Saudi Aramco to develop predictive capability of combustion phenomena in IC engines, specifically focused on fuel formulation issues. This program will be introduced in the talk.