

Burning Old Fuels in New Ways. Recent Results in Combustion Research

Derek Dunn-Rankin
Department of Mechanical and Aerospace Engineering
University of California, Irvine

Abstract

The global relationship between fuel utilization and environmental impact makes the fundamental understanding of combustion processes more important than ever. Rather than focus on a single topic, this presentation introduces some of our recent combustion research relevant to this relationship, particularly as regards the effective utilization of fairly traditional fuels. The studies include improved efficiency of miniature liquid-fueled combustion systems, electrical properties of diffusion and partially-premixed flames, controlled breakup of droplet streams, fuel emulsion formation and sprays of emulsified fuels, flame holding in a model turbine burner channel, ammonium bisulfate formation in the simulated flue gas from a coal boiler, control of mercury emissions and carbon-in-ash from pulverized coal and coal/biomass combustion, the combustion of fuel hydrates, and homogeneous charge compression ignition (HCCI) in a small-scale engine.