

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Development of a Burner System and Rayleigh Scattering Method to Measure Soot Concentration for Diesel-Relevant Fuels¹ SARA FLETCHER, Washington University in St Louis, BRIAN FISHER, University of Alabama — Soot, a harmful component of particulate matter, is found in high concentrations in diesel exhaust. This work aims to develop a better understanding of the relationship between chemical structure and soot evolution, which is expected to inform methods to reduce or eliminate soot in diesel combustion. Successful aspects of previous experiments have been combined into a new method to characterize soot formation, growth, and oxidation. Soot is quantified via combined Rayleigh scattering and extinction, using a pulsed 532-nm Nd:YAG laser and sensitive photodetectors. A methane/oxygen diffusion flame serves as a baseline, then species of interest are doped into the fuel stream in low concentration and the change in soot is quantified relative to the base flame. This perturbation method enables study of soot for different species in a flame that has nominally constant global properties. This study focused on fuel components n-heptane and toluene, which have straight-chain and aromatic molecular structures, respectively. Soot was quantified throughout the flame, and it was found that the soot scattering signal was significantly higher for toluene than for n-heptane. Analysis of the signals to quantify actual soot concentrations remains a topic of future work.

¹Funding from NSF REU grant 1062611

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Date submitted: 24 Jul 2013

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