Sooting Limits of Nonpremixed n-Heptane, n-Butanol, and Methyl Butanoate Flames: Experimental Determination and Mechanistic Analysis

Authors

Sili Deng, Jeremy A. Koch, Michael E. Mueller, Chung K. Law

Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ 08544, USA

Corresponding Author

Sili Deng
Department of Mechanical and Aerospace Engineering
Princeton University
Engineering Quadrangle, Room D214
Princeton, NJ 08544
Ph.: 1 609 258 5178
Fax: 1 609 258 6233
Email: silideng@princeton.edu

In this work, the sooting limits of nonpremixed n-heptane, n-butanol, and methyl butanoate flames were determined experimentally in a liquid pool stagnation-flow configuration. In addition, complementary simulations with detailed polycyclic aromatic hydrocarbon (PAH) chemistry and a detailed soot model were performed and compared with the experimental critical strain rates for the sooting flames. For all three fuels, the response of soot volume fraction to strain rate, chemical pathways for PAH formation, and the rate-limiting steps were examined to interpret the experimental and computational results.

This manuscript is not being considered for other journal publications.