

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

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Highlights

- The sooting limits of nonpremixed n -heptane, n -butanol, and methyl butanoate flames were determined experimentally in a liquid pool stagnation-flow configuration.
- Simulations with detailed polycyclic aromatic hydrocarbon 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.
- Methyl butanoate was found significantly less sooting compared to n -heptane and n -butanol.
- The differences in sooting tendencies are due to the fuel breakdown processes to produce soot precursors.