Abstract Submitted
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Damköhler number effects on soot formation and growth in turbulent nonpremixed flames FABRIZIO BISETTI, ANTONIO ATTILI, King Abdullah University of Science and Technology, MICHAEL E. MUELLER, Princeton University, HEINZ PITSCH, RWTH Aachen University — An analysis of soot formation and growth, based on a set of large simulations of n-heptane/air turbulent nonpremixed combustion, is presented. A detailed chemical mechanism, which includes polycyclic aromatic hydrocarbons, and a high-order method of moments for soot modeling are employed for the first time in the three-dimensional simulation of turbulent sooting flames. The effects of scalar dissipation rate on the soot growth are studied performing three simulations at different Damköhler number while holding the Reynolds number constant. The temperature field is unchanged by the rescaling, due to negligible extinction in all cases. Soot precursors are more sensitive to strain than temperature and their peak concentration decreases by about 40% and 80% as the Damköhler number is reduced by a factor of 2 and 4. It is shown that decreasing the Damköhler number does not affect the soot number density, while the soot mass fraction shows a linear dependence on Damköhler number.

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