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On the effects of gas-phase species Lewis number in turbulent nonpremixed sooting flames FABRIZIO BISETTI, ANTONIO ATTILI, King Abdullah University of Science and Technology, MICHAEL MUELLER, Princeton University, HEINZ PITSCH, RWTH Aachen University — Two large DNS of n-heptane/air turbulent nonpremixed combustion are compared to asses the effects of gas-phase species Lewis number on the dynamics of soot formation and growth. A detailed chemical mechanism, which includes PAHs, 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 results obtained employing a complex model (mixture average) for the transport of heat and mass [Attili *et al.* Comb. Flame, 161, 2014] are compared with those calculated with Le=1 for all gas-phase species, including large soot precursor molecules. It is found that the statistics of temperature and other species governing the heat releasing chemistry are very similar in the two cases as the flow field achieves a fully turbulent state. The dynamics of the soot precursors and soot display quantitative differences between the two cases. Employing the Le=1 approximation, the total mass of soot precursors in the flame decreases by 10 to 20% only, but its field is less inhomogeneous in space and time. Due to the non-linearity of soot growth with respect to the concentration of gas-phase precursors, the domain-averaged rate of soot mass production decreases by a factor of 2.

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