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Direct numerical simulation of temporally evolving turbulent luminous jet flames with detailed fuel and soot chemistry VIVIEN LECOUSTRE, University of Maryland, PAUL ARIAS, University of Michigan, SOMESH ROY, Pennsylvania State University, WEI WANG, University of Tennessee, ZHAOYU LUO, University of Connecticut, DAN HAWORTH, Pennsylvania State University, HONG IM, University of Michigan, TIANFENG LU, University of Connecticut, KWAN-LIU MA, University of California-Davis, RAMANAN SANKARAN, Oak Ridge National Laboratory, ARNAUD TROUVE, University of Maryland — Direct numerical simulations of 2D temporally-evolving luminous turbulent ethylene-air jet diffusion flames are performed using a high-order compressible Navier-Stokes solver. The simulations use a reduced mechanism derived from a detailed ethylene-air chemical kinetic mechanism that includes the reaction pathways for the formation of polycyclic aromatic hydrocarbons. The gas-phase chemistry is coupled with a detailed soot particle model based on the method of moments with interpolative closure that accounts for soot nucleation, coagulation, surface growth through HACA mechanism, and oxidation. Radiative heat transfer of CO_2, H_2O, and soot is treated by solving the radiative transfer equation using the discrete transfer method. This work presents preliminary results of radiation effects on soot dynamics at the tip of a jet diffusion flame with a particular focus on soot formation/oxidation.

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