Abstract Submitted
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Fundamental Studies of Turbulent Liquid Spray Mixing and Combustion[1] CHRISTOPHER RUTLAND, YUNLIANG WANG, University of Wisconsin - Madison — Fundamental simulations are used to investigate the ignition process of turbulent n-heptane liquid fuel spray jets. Full two-way coupling between the phases and a detailed chemical mechanism with 33 species and 64 reactions are used. Both time developing and spatially developing liquid spray jets are studied. In the time developing case it was found that ignition first occurs at the edges of the jets where the fuel mixture is lean, and the scalar dissipation rate and vorticity magnitude are low. For smaller droplets, higher initial droplet velocity causes the ignition to occur earlier, whereas for larger droplets, higher initial droplet velocity delays the ignition time. In the spatially developing liquid jets, ignition and flame lift-off characteristics similar to diesel sprays are observed. Near the injector, combustion development progresses very rapidly along the stoichiometric surface. In the downstream region of the spray, combustion develops with steep temperature fronts in a flamelet mode.

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