Abstract Submitted
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Periodic Partial Extinction Regime in Acoustically Coupled Fuel Droplet Combustion[1] MIGUEL PLASCENCIA QUIROZ, JOHN BENNEWITZ, ANDRES VARGAS, HYUNG SUB SIM, OWEN SMITH, ANN KARAGOZIAN, UCLA — This experimental study investigates the response of burning liquid fuel droplets exposed to standing acoustic waves, extending prior studies quantifying mean and temporal flame response to moderate acoustic excitation[2]. This investigation explores alternative fuels exposed to a range of acoustic forcing conditions (frequencies and amplitudes), with a focus on ethanol and JP-8. Three fundamental flame regimes are observed: sustained oscillatory combustion, periodic partial extinction and reignition (PPER), and full extinction. Phase-locked OH* chemiluminescence imaging and local temporal pressure measurements allow quantification of the combustion-acoustic coupling through the local Rayleigh index G. As expected, PPER produces negative G values, despite having clear flame oscillations. PPER is observed to occur at low-frequency, high amplitude excitation, where the acoustic time scales are large compared with kinetic/reaction times scales for diffusion-limited combustion processes. These quantitative differences in behavior are determined to depend on localized fluid mechanical strain created by the acoustic excitation as well as reaction kinetics.

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[2]Sevilla, et al., Comb. Flame **161**, pp. 1604-1619, 2014

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