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Acoustical Excitation of Burning Droplets in Microgravity and Normal Gravity[1] SRINIVASAN DATTARAJAN, Worcester Polytechnic Institute, OWEN SMITH, ANN KARAGOZIAN, UCLA — This experimental study focused on methanol droplet combustion characteristics during exposure to external acoustical perturbations in both normal gravity and microgravity. Emphasis was placed on examination of excitation conditions in which the droplet was situated at or near a pressure node or antinode. Acoustic excitation had a significantly greater influence on droplet burning rates and flame structures in microgravity as compared with those in normal gravity. In normal gravity, acoustic excitation of droplets situated near a pressure node produced only very moderate increases in burning rate (about 11-15% higher than for non-acoustically excited, burning droplets) and produced no significant change in burning rate near a pressure antinode in normal gravity. In microgravity, for the same range in sound pressure level, droplet burning rates increased by over 75% and 200% for droplets situated at or near pressure antinode and pressure node locations, respectively. Observed flame deformations for droplets situated near pressure nodes or antinodes were generally consistent with the notion of acoustic radiation forces arising in connection with acoustic streaming, yet both velocity and pressure perturbations were seen to affect flame behavior, even when the droplet was situated precisely at or extremely close to node or antinode locations.

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