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Mixing Characteristics of Strongly-Forced Jet Flames in Crossflow KEVIN MARR, NOEL CLEMENS, OFODIKE EZEKOYE, University of Texas at Austin — The effects of high frequency, large-amplitude forcing on the characteristics of a non-premixed jet flame in crossflow (JFICF) at mean Reynolds numbers of 3,200 and 4,850 are studied experimentally. Harmonic forcing of the jet fuel results in a drastic decrease in flame length and complete suppression of soot luminosity. Visualization by planar laser Mie scattering shows that forced JFICF, similar to forced free or coflow jet flames, are characterized by ejection of high-momentum, deeply penetrating vortical structures. These structures rapidly breakdown and promote intense turbulent mixing in the near region of the jet. The rapid mixing resembles a "one-step" process going from a fuel rich state far in the nozzle to a well-mixed, but significantly diluted, state just a few diameters from the jet exit plane. Exhaust gas emissions measurements indicate a decrease in NOx, but increases in CO and unburned hydrocarbons with increasing forcing amplitude. Acetone PLIF measurements are used to investigate the effect of partial-premixing on these emissions findings.

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