DFD13-2013-001917

Abstract for an Invited Paper
for the DFD13 Meeting of
the American Physical Society

Highly Turbulent Counterflow Flames: A Laboratory Scale Benchmark for Practical Combustion Systems

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Since the pioneering work of Weinberg's group at Imperial College in the '60s, the counterflow system has been the workhorse of laminar flame studies. Recent developments have shown that it is also a promising benchmark for highly *turbulent* ($\mathrm{Re}_t \sim 1000$) nonpremixed and premixed flames of direct relevance to gasturbine combustion. Case studies will demonstrate the versatility of the system in mimicking real flame effects, such as heat loss and flame stratification in premixed flames, and the compactness of the combustion region. The system may offer significant advantages from a computational viewpoint, including: a) aerodynamic flame stabilization near the interface between the two opposed jets, with ensuing simplifications in the prescription of boundary conditions; b) a fiftyfold reduction of the domain of interest as compared to conventional nonpremixed jet flames at the same Reynolds number; and c) millisecond mean residence times, which is particularly useful for DNS/LES computational modeling, and for soot suppression in the combustion of practical fuels.

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