Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Near-limit H_2-O_2-N_2 combustion in nonpremixed counterflow mixing layers PRABAKARAN RAJAMANICKAM, University of California San Diego, JAIME CARPIO, Universidad Politecnica de Madrid, ANTONIO L. SANCHEZ, University of California San Diego, PAUL D. RONNEY, University of Southern California, FORMAN A. WILLIAMS, University of California San Diego — Numerical computations employing detailed chemistry and experiments in a slot-jet counterflow burner are used to characterize the different combustion modes emerging in mixing layers separating N_2-diluted counterflowing planar streams of hydrogen and oxygen. Attention is focused on high degrees of dilution resulting in near-critical flames with peak temperatures close to the crossover temperature. A bifurcation diagram is presented in the mixture-fraction vs. strain-rate plane that identifies six different combustion regimes involving four different flame types, namely, diffusion-flame sheets, propagating/retreating edge flames, broken-flame tubes, and isolated flame tubes. While the isolated flame tube is always stationary, the broken flame tubes can be stationary or can propagate with an oscillatory speed. The observed flame behavior exhibits hysteresis in some parametric regions, where the flow that is established depends on the ignition mechanism.

Antonio L. Sanchez
University of California San Diego

Date submitted: 31 Jul 2019 Electronic form version 1.4