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Experimental investigations on Ethylene-air Continuous Rotating Detonation Wave in the hollow chamber with Laval Nozzle

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Abstract: The ethylene-air Continuous Rotating Detonation (CRD) has been experimentally achieved with large operating domain, little velocity deficit and notable pressure rise in the hollow chamber with Laval nozzle. The results show that the lean limit increases while operating domain decreases with contraction ratio increasing. Deflagration flame in recirculation zone and larger width combustor enable the ethylene-air CRD to be readily achieved. Three different propagation modes are presented. Most of the achieved CRD experiments are single-wave mode. The highest frequency and velocity are 6.10 kHz and 1915.40 m/s respectively. Two-waves mode can be obtained when contraction ratio is 12. Sawtooth wave mode appears around lean limit when contraction ratio is 1,2 and 4. Sawtooth wave, as a critical condition, can be transformed into typical CRD wave or extinguish. For contraction ratios of 1,2,4 and 6, the propagation stability increases with equivalence ratio (ER) increasing. For contraction ratios of 8,10 and 12, the stability decreases with a

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