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Detonations of liquid oxygen sprays in gaseous hydrogen for pulse detonation rockets are described. The liquid oxygen is atomized and sprayed into a high pressure hydrogen flow. Detonations are initiated by a hotwire igniter or with a laser pulse. The pressures and densities of the fuel and oxidizer are varied to determine the effects on mixture burning velocities. Initial conditions are varied to determine the effects on the shock initiation of the detonation wave. The results of these investigations are presented and discussed.

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Detonations of Liquid Oxygen Sprays in Gaseous Hydrogen for Pulse Detonation Rockets

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Detonations of flowing mixtures of cryogenic gaseous hydrogen and liquid oxygen at mixture densities of 3-6 Kg/m$^3$ and varying liquid oxygen fractions have been studied. Wave speeds, pressures, and the time required to effect detonation-to-deflagration transition are reported. Data taken at cryogenic conditions are compared with data taken at equal initial densities and equivalence ratios, but at ambient temperature, as well as with equilibrium, Chapman-Jouget calculations. This work has been undertaken to support development of pulse detonation rocket engines. These results will be directly applicable to the development of the next generation of repetitively pulsed, multi-tube test articles and will also be used to qualify computational models under development for use in system application studies.

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