EFFECT OF FLAME CHEMI-IONIZATION ON VISIBLE / UV EMISSION FROM SUPERSONIC FLOWS

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The effect of electrons produced in hydrocarbon-air flames by chemi-ionization on emission from a supersonic flow downstream of the flame is investigated. The air-fuel mixture (C_2H_4-air) is ignited in the plenum of a supersonic nozzle at pressures of P=300-450 Torr. Ionization of the flow in the M=3 test section downstream of the nozzle is measured using a Thomson probe, by applying below-breakdown voltage to two plane electrodes flush mounted in the test section walls. In the saturation regime, the Thomson probe removes nearly all electrons generated in the flame by chemi-ionization. Previous use of this method in optically pumped CO-N_2 plasma sustained by a CO laser in a slow-flow absorption cell demonstrated that electron removal results in dramatic reduction of emission from the plasma (CN violet and C_2 Swan bands). In the present study, the effect of electrons on emission from the M=3 test section, CH (4300 A band system), C_2 (Swan bands), CO (Angstrom bands), and OH ($A^2\Sigma^+$-$X^2\Pi$ system), is monitored by an Optical Multichannel Analyzer with an ICCD camera.