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Plasma decay in Air and N_2:O_2:CO_2 mixtures at elevated gas temperatures NICKOLAY ALEKSANDROV, SVETLANA KINDUSHEVA, ILYA KOSAREV, Moscow Institutte of Physics and Technology, ANDREI STARIKOVSKII, Drexel University — Plasma decay after a high-voltage nanosecond discharge has been studied experimentally and numerically behind an incident and reflected shock wave in high temperature (900 – 3000 K) air and N_2:O_2:CO_2 mixtures for pressures between 0.1 and 2 atm. Time-resolved electron density history was measured by a microwave interferometer for initial electron densities in the range (1-3)x10^{12} cm^{-3}. It was shown that the electron density varies in the air afterglow in the "recombination manner", $1/n_e(t) = 1/n_e(0) + \alpha_{eff}t$, where α_{eff} is the effective electron-ion recombination coefficient. A numerical simulation was carried out to describe the temporal evolution of the densities of charged particles under the conditions considered. A good agreement was obtained between the calculated and the measured electron density histories in the air afterglow when taking into account electron attachment to O_2 to form O_2^- ions and electron detachment from them, as well as electron-ion and ion-ion recombination. In CO_2-containing mixtures, it was necessary to consider the formation of complex negative and positive ions. These ions were formed in three-body reactions; therefore, the rate of plasma decay increased with gas density.

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