Kinetics of N2 : O2 mixtures at high DEPOSITED SPECIFIC ENERGIES: FEATURES OF FAST GAS HEATING AND DISSOCIATION OF NITROGEN MOLECULES BY A HIGH-CURRENT NANOSECOND DISCHARGE

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Experimental and theoretical studies of the fast gas heating and the dissociation of nitrogen molecules initiated by a high-current nanosecond discharge in nitrogen-oxygen mixtures at P = 5–40 Torr were carried out. The measurements of temporal dynamics of discharge current, electric field value and gas temperature will be presented. The experimental setup and measurement techniques are described in [1].

Along with this, the results of 1-D calculations of the dynamics of the reduced electric field E/N, the concentration of charged particles, nitrogen atoms in the ground N(4S) and excited N(2D,2P) states, and also the gas heating will be presented. Description of the model is given in [2]. A comparison of the calculated and experimental data on the gas heating dynamics in N2 : 1% O2 and N2 : 20% O2 mixtures at P = 20 Torr is shown in Fig. (a) and (b). The specific input energy reached W = 1 eV/mol, and the most of discharge energy is spent at E/N = 150–250 Td. Under given conditions, the dissociation degree of nitrogen molecules exceeded [N(4S)]/[N2(X)] ≥ 15% and the main production of N(4S,2D) atoms was occurred in reactions of electron impact dissociation of electronically excited N2 molecules N2(A3Σu+, B3Пg, C3Пu).

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References

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