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Plasma decay in air excited by high-voltage nanosecond discharge
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STARIKOVSKAIA, ANDREY STARIKOVSKIY, MIPT TEAM — Plasma decay
in air after a high-voltage nanosecond discharge has been studied experimentally
and numerically at room temperature for pressures between 1 and 10 Torr. Time-
resolved electron density was measured by a microwave interferometer for initial
electron densities in the range $(2 - 3) \times 10^{12} \text{ cm}^{-3}$. Discharge non-uniformity was
investigated by optical methods. The balance equations for charged particles and
electron temperature were numerically solved to describe the temporal evolution of
the densities of electrons and ions in the discharge afterglow. It was shown that
the loss of electrons is governed by dissociative and three-body recombination with
 O_2^+ ions under the conditions considered. Good agreement between the calculated
and measured electron density histories could be obtained only when increasing the
rate of three-body recombination by an order of magnitude and when changing the
dependence of the recombination rate on electron temperature. This could testify
that the well-known mechanism of three-body recombination of atomic ions changes
in the case of molecular ions.

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