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Plasma recombination in hydrocarbons and hydrocarbon:oxygen mixtures after high-voltage nanosecond discharge EUGENE ANOKHIN, MAXIM POPOV, Moscow Institute of Physics and Technology, IGOR KOCHETOV, Triniti, ANDREY STARIKOVSKIY, Princeton University, NIKOLAY ALEKSANDROV, Moscow Institute of Physics and Technology, MOSCOW INSTITUTE OF PHYSICS AND TECHNOLOGY TEAM, TRINITY TEAM, PRINCETON UNIVERSITY TEAM — The results of the experimental and numerical study of high-voltage nanosecond discharge afterglow in pure ethane, propane and hydrocarbon:oxygen mixtures are presented for room temperature and pressures from 2 to 20 Torr. Time-resolved electron density during the plasma decay was measured with a microwave interferometer for initial electron densities in the range between 510^{10} and 310^{12} cm^{-3} and the effective recombination coefficients were obtained. Measured effective recombination coefficients increased with gas pressure and were much higher than the recombination coefficients for simple molecular hydrocarbon ions. Synergistic effect was observed in hydrocarbon:oxygen mixtures when the recombination rates in the mixtures were higher than those in pure hydrocarbon and in pure oxygen. Calculations showed that electrons had time to thermalize prior to the recombination in hydrocarbon-containing plasma. The measured data were interpreted under the assumption that cluster hydrocarbon ions are formed during the plasma decay that is controlled by the dissociative electron recombination with these ions at electron room temperature.

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