Abstract Submitted
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Comparison of Thomson scattering measurements and kinetic modeling of electron recombination in nanosecond pulsed discharges with CO_2 and O_2 diluted in Ar.[1] YUE WU, CHRISTOPHER LIMBACH, Texas A&M University, ANDREY STARIKOVSKIY, Princeton University, RICHARD MILES, Texas A&M University — Accurate prediction of electron recombination rates in complex gas mixtures critically influences the development and operational conditions of repetitively pulsed and continuous running low temperature plasma sources. Time and space-resolved recombination in Ar with additions of CO_2 and O_2 is studied through combined experimental measurements by Thomson scattering and kinetic modeling. Single nanosecond pulsed discharges are produced in a pin-to-sphere discharge geometry at a pressure of 80 Torr. Subsequent to pulsed excitation at 20 kV, spatiotemporal Thomson scattering measurements of electron density and electron temperature are obtained. Relative to a pure argon discharge, addition of 0.75% CO_2 suppresses the initial plasma density by nearly a factor of two, while O_2 dilution of 1.0% slightly decreases both the initial electron density and electron temperature. These results are compared to a kinetic model of the discharge afterglow developed to study recombination processes and plasma chemistry. The model results clarify that the presence of molecular ions accelerates the plasma decay through dissociative recombination and the molecular gas admixture accelerates the relaxation of the electron temperature at low electron energies, especially in the case of CO_2 addition.

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