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Energy transport in atmospheric-pressure plasmas driven by pulsed microwave[1] WOOJIN NAM, SEOK-YONG JEONG, JAE KOO LEE, GUNSU YUN, Pohang University of Science and Technology — Plasma state can persist after the removal of external driving power via the release of the energy stored in the plasma particles. The energy release contributes to the generation of excited species and subsequent radiative de-excitation, which is well known phenomena called afterglow in low-pressure plasmas. We have studied the energy transport in atmospheric-pressure argon plasma generated by microwave resonator with the focus on the temporal dynamics of the afterglow in pulse operation. Substantial afterglow in both continuum and atomic line emissions has been observed during the pulse-off time because the recombination rate of argon ions increases rapidly with the decrease of electron temperature. Compared to continuous wave (CW) operation, the time-averaged atomic line emission intensities are enhanced in the pulsed operation with high repetition rate ($>$ 100 kHz, 50% duty). A global simulation incorporating the pulse power coupling shows that the impedance mismatch between the plasma and the resonator can be minimized in the pulse operation compared to CW operation. An optimization scheme for pulse operation has been deduced and can be utilized to maximize the power coupling efficiency and the generation of reactive species in plasma source devices of resonator type.

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