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Spatiotemporal evolutions of gas density and gas temperature in spark-plug assisted atmospheric-pressure microwave discharges MANSOUR ELSABBAGH, Hokkaido University, Japan, SHINICHIRO KADO, The University of Tokyo, MASASHI KANEKO, YUJI IKEDA, Imagineering Inc., Japan, KOICHI SASAKI, Hokkaido University, Japan, THE UNIVERSITY OF TOKYO COLLABORATION, IMAGINEERING INC. COLLABORATION — The gas temperature (T_g) and gas density (n) are important parameters in plasma-assisted combustion. The gas heating results in the concomitant reduction of the gas density. The reduction of the gas density affects the reduced electric field (E/n) in the plasma, and correspondingly all the plasma parameters which depend on E/n. In this work, a rotational Raman scattering technique was used for measuring spatiotemporal evolutions of T_g and the density (n_{N2}) of molecular nitrogen in spark-plug assisted atmospheric-pressure microwave discharges generated in N_2-He mixture (N_2/He = 700/50 Torr) with pulsed microwave power of 360 W. Measured values of T_g in the discharge phase suggests that the discharge is in a nonequilibrium state. Unexpected, significant depletion of n_{N2} (up to 95%) was observed in the intermediate stage of the discharge phase and in the early afterglow at a distance of 4.5 mm from the discharge center. Although the most probable mechanism for the significant depletion of N_2 is dissociation, further investigation is necessary to confirm the huge degree of dissociation.

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