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Thomson scattering in high-pressure microwave plasmas for plasma-assisted combustion in automobile engines K. SASAKI, S. SOMA, Hokkaido University, Y. IKEDA, Imagineering, Inc. — Nonequilibrium plasmas are preferable in plasma-assisted combustion of automobile engines. We have developed a microwave plasma source, which can work at pressures higher than the pressure of atmosphere, with the intension of applying it to plasma-assisted combustion. In this work, we investigated the electron temperature in the microwave plasma source by laser Thomson scattering. The power supply for the discharge was a semiconductor-based microwave source at 2.45 GHz. We produced pulsed discharges with a duration of 2 ms. The discharge gas in this experiment was helium. We constructed a triple-grating spectrograph with a focal length of 200 mm and three diffractive gratings of 1800 grooves/mm. The light source was the second harmonic of a Nd:YAG laser (532 nm). The spectrum of the scattered laser light was recorded using an ICCD camera working at the photon-counting mode. The electron temperature observed experimentally ranged between 1 and 2.5 eV even when the plasmas were produced at pressures up to 0.3 MP. On the other hand, the gas temperature, which was evaluated from the optical emission spectrum of impurity OH, was lower than 1800 K. Therefore, we have confirmed that a nonequilibrium plasma can be produced in helium at pressures higher than the pressure of atmosphere.

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