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Generation and optical diagnostics of pulse-modulated microwave plasma in high-pressure argon KENICHI INOUE, NORITAKA SAKAKIBARA, The University of Tokyo, JAEHO KIM, National Institute of Advanced Industrial Science and Technology, TSUYOHITO ITO, KAZUO TERASHIMA, The University of Tokyo — High electron density plasma in high-density media provides highly reactive environments. Such plasma could be useful for developing rapid materials processing as well as synthesizing non-equilibrium materials. To achieve high-density plasma in high-pressure argon up to 1.0 MPa, we apply pulse-modulated microwave in this study. Because of the electron confinement, microwave plasma generally reaches high electron density. Pulse modulation is expected to enhance non-equilibrium properties and to provide further controllability of the processes, e.g. keeping low temperature and suppressing heat damages to materials. The pulse-modulated microwave plasmas were generated at the pressures of 0.1-1.0 MPa with the pulse frequency of 100-1000 Hz. The spatio-temporal structure of the plasmas was investigated via high-speed-camera analysis; confirming the pulse-modulated generation of plasma in 1 mm space at 0.1 MPa. Optical emission spectroscopy and near-infrared laser heterodyne interferometry were performed; indicating that the electron densities were in the order of 10^{23} m^{-3}.

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