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Properties of inductively coupled rf CH_4/H_2 discharges TAKASHI KIMURA, HIROKI KASUGAI, Nagoya Institute of Technology — Experiments with a Langmuir probe and optical emission spectroscopy combined with actinometry are carried out in inductive CH_4/H_2 plasmas in the total pressure ranges from 25m to 100mTorr. These plasmas are produced in the cylindrical stainless steel chamber with 160 mm in inner diameter and 75 mm in length, where the power injected into the plasma is 140W. The measured electron energy probability functions (EEPFs) are approximately Maxwellian. The measured electron density, which is on the order of 10^{16} m^{-3}, gradually decreases with increasing the hydrogen fraction, whereas the measured effective electron temperature gradually increases. The density of hydrogen atoms estimated by actinometry gradually increases with the increase in hydrogen fraction, whereas the intensity emitted from the excited molecular hydrogens is detected even at pure CH_4 discharges, and then gradually increases with the increase in the hydrogen fraction. The relative CH and C_2 densities, which are roughly estimated from dividing the intensities emitted from the excited CH and C_2 by the electron density, decrease with the increase in hydrogen fraction. A global model for electropositive plasma is used in order to investigate the plasma chemistry in CH_4/H_2 discharges assuming the Maxwellian electron energy distribution. The model results are compared with the experimental results, obtaining reasonably good agreement.

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