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Investigation of inductively coupled CF_4/O_2 discharges by Langmuir probe method and optical emission spectroscopy TAKASHI KIMURA, MASAHISA NOTO, Nagoya Institute of Technology — The oxygen content dependence of the plasma parameters in inductively coupled CF_4/O_2 plasmas was investigated by Langmuir probe and optical emission spectroscopy. Plasma was produced in the cylindrical stainless steel chamber with 160 mm in inner diameter and 75 mm in length. Experiment was performed at three total pressures of 8m, 15m and 25 mTorr. The electron energy probability functions (EETFs) were approximately Maxwellian at any oxygen content, although a slight enhancement of EETF with respect to a Maxwellian distribution was observed at the energy region lower than 2-3 eV for the oxygen content lower than 70%. The electron density decreased in the oxygen content below 20%, beyond which it remained nearly constant. On the other hand, the measured electron temperature did not depend strongly on the content. The densities of fluorine and oxygen atoms were also investigated by actinometry method. The fluorine atom density increased markedly as oxygen was mixed to CF_4 discharges, and then reached the maximum around the oxygen content of 20 - 30%, beyond which it decreased with increasing oxygen content. The oxygen atom density increased with the increase in the oxygen content and saturated at about 50% oxygen content. A global model for electronegative plasma was used in order to study the dependence of the plasma parameters on the oxygen content assuming the Maxwellian electron energy distribution.

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