Abstract Submitted
for the GEC08 Meeting of
The American Physical Society

Experiment and global model of inductively coupled RF Ar/N_2 discharges TAKASHI KIMURA, HIROKI KASUGAI, Nagoya Institute of Technology — Plasmas containing N_2 have been attracted as a source of active species such as the active atomic nitrogen and the excited nitrogen molecules in the field of material science. In this study, measurements with a Langmuir probe and optical emission spectroscopy are carried out in inductively coupled RF (13.56 MHz) Ar/N_2 discharges in the total pressure range from 20mTorr to 100mTorr, changing the N_2 content from 5% to 50%. Plasmas are produced in the cylindrical stainless steel chamber with 160 mm in inner diameter and 40 mm in length, where the power injected into the plasma is 200W. The structure of the measured electron energy probability function (EEPF) can be approximated as a Druyvesteyn-like distribution at any N_2 content. The electron density, which is on the order of 10^{16}-$10^{17}(m^{-3})$, increases with increasing the Ar content, whereas the effective electron temperature slightly decreases. The vibrational and rotational temperatures can be estimated from the optical emission spectroscopy of N_2 second positive system. The vibrational temperature is higher than 10000K at any experimental condition, and the rotational temperature monotonically increases from 500K to 1000K with the increase in the Ar content. Moreover, the N_2 dissociation rate, which corresponds to the density ratio of N to N_2, can be estimated by actinometry. The dissociation rate reaches the maximum when the Ar content is about 85%.

Takashi Kimura
Nagoya Institute of Technology

Date submitted: 17 Jun 2008 Electronic form version 1.4