Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Investigations on metastable helium atoms in a capacitively coupled plasma in a mixture of He, Ar and CF4[1] WEN-CONG CHEN, Tsinghua University, DIRK LUGGENHÖLSCHER, Ruhr-University Bochum, JIANG LI, FENG XIE, FEI-XIANG LIU, XI-MING ZHU, YI-KANG PU, Tsinghua University — Spatially resolved density and temperature of helium metastable state 2^3S_1 in a parallel plate capacitively coupled plasma in He/Ar/CF4 are measured by laser absorption spectroscopy using a 1083nm distributed feed-back semiconductor laser. Because of lower electron density and possible quenching processes in the sheath, the profile of metastables density shows that the density has a more pronounced fall-off in the sheath than in the bulk plasma. It is also found that the metastables temperature near the powered electrode is higher than that near the grounded one. Other diagnostics are also used to determine related plasma parameters. The electron density is obtained by an emission line-ratio method, and the gas temperature is estimated from rotational spectra of nitrogen molecules. Ion energy distributions, ion fluxes and radical densities are measured by an energy-resolved mass spectrometer. The behavior of metastables helium atoms and the possible kinetic processes will be discussed in this work.

[1]This work is supported by the NSFC grant (Nos. 10775087 & 10935006).

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Date submitted: 13 Jun 2010 Electronic form version 1.4