The 2nd Harmonic ECR Microplasma in Narrow Closed Space for Low Pressure Conditions

HIROSHI FUJIYAMA, AKIHIRO YUKISHIGE, KE YAN, MASANORI SHINOHARA, Nagasaki University, TATSUYUKI NAKATANI, Toyo Advanced Technology — Plasma generation in narrow closed space has been succeeded for the pressure of 0.01Torr and gap length of 500µm in xenon gas for the 2nd harmonic Electron Cyclotron Resonance (2nd harmonic ECR). Resonant confinement of electrons at the 2nd harmonic ECR leads to interesting micro plasma characteristics: the higher electron density, the lower plasma potential, the lower electron temperature and the effective power absorption against with the well-known ECR plasma. PIC-MC simulation of low pressure micro plasma supported such interesting plasma characteristics obtained by the experiments and simulations. In the experiments, it was found that the typical micro plasma characteristics: the higher electron density, the lower plasma potential, the lower electron temperature became remarkable. The ionization degree for the 2nd harmonic ECR plasma in the present research, showed about $10^{-3}$ by 2 order higher than that of PDP micro plasma.

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