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Electron Temperature and Ion Density measurements of an ECR Plasma with Magnetron Magnetic Field Configuration

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The generation of Hyperthernal (1 ~ 100 eV) Neutral Beam (HNB) has been studied for solving the problems of material processing such etching and deposition. The HNB source developed by S.J.Yoo et al. consists of an inductively coupled plasma between a neutralization plate made of a metal plate and a substrate. The source has the beam transport problem from the neutralization plate to the substrate due to collisions of the HNB with the background gases. We has developed a new HNB source in which a 2.45-GHz ECR plasma with magnetron magnetic field configuration is adopted in order to solve the beam transport problem. The operating pressure is varied from 0.1 mTorr to 0.5 mTorr and the microwave power from 150 W to 250 W. A planar Langmuir probe is used to measure the ECR plasma parameters at a distance of 25 mm to 40 mm from the neutralization plate where B is below 300 G. The optical emission spectroscopy (OES) with the line ratio method of HeI (504.8 / 471.3 nm) is applied to measure the electron temperature at a distance of 2 mm to 30 mm from the neutralization plate and the results are compared with those measured by the Langmuir probe. The electron temperature decreases from 11 eV to 4 eV and the ion density also decreases from $8*10^{10}$ cm^{-3} to $1*10^{10}$ cm^{-3} along the beam axis.