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Two-dimensional Simulation for Magnetically Enhanced Large-Area Processing Plasmas

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Radio-frequency inductively coupled plasma (ICP) discharges have been widely used as high-density plasma sources in material processing such as thin-film deposition and etching. With the increased reactor size, high density and good uniformity become more important.[1,2] Generally, magnetically enhanced inductively coupled plasmas (MICP) have a higher plasma density for a given power deposition due to their high ionization efficiency and increased power absorbing efficiency than ICP sources. To investigate the discharge phenomenon in the chamber that consists of embedded antenna coils in the rectangular system with permanent magnetic arrays, we have developed a magnetized two-dimensional (2-D) fluid simulation model. We have used the Poisson Superfish code to obtain 2-D realistic magnetic field. The parameters, which affect non-uniformity, electron temperature, and others, can be explained in a manner similar to the inductively coupled plasma source with a cylindrical chamber. Our simulation results show that the high density and good uniformity plasma can be obtained in the embedded antenna coil system with suitable magnetic arrangement. These simulation results are compared with the experiments. This work is supported by National Research Laboratory program of Korea Ministry of Science and Technology.

[References]

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