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Abstract

It has already been demonstrated that fluid models can be used to simulate two-dimensional axisymmetric inductively coupled plasma via implementation in the COMSOL (multi-physics simulation software) platform. In this study, we improved the model and simulated a large scale magnetized inductively coupled plasma generator filled with argon to study the effect of the static magnetized field on inductively coupled plasma discharges. In fact, before the static magnetized field is applied, the electron transport mobility is isotropic; and after the static magnetized field is applied, the electron transport mobility is anisotropic. Distributions of the number density and temperature of electrons were obtained for various input powers, pressures, and magnetized field configurations. In addition, the macro-gas temperature distribution was obtained for different magnetized field configurations. There are four multiphysics coupling interfaces in our simulation model, namely the ICP discharge interface, static magnetized field interface, laminar Flow interface, and heat transfer in fluids interface, they achieve the mutual coupling via the related physical quantities. We conclude that the distributions of the number density of the electrons can be improved by the addition of a static magnetized field.

Figures used in the abstract

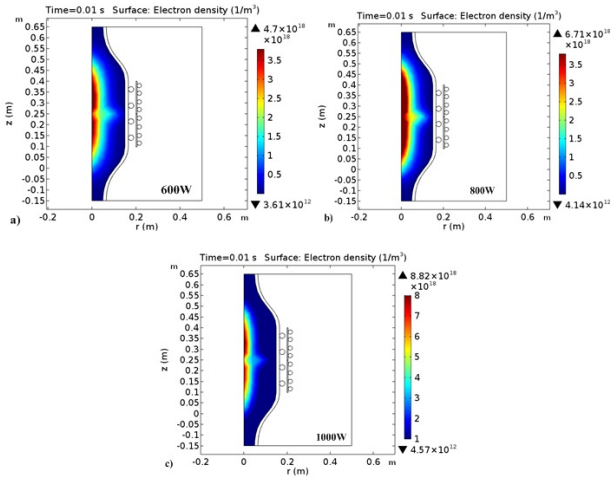

Figure 1: Power dependence of the electron density distribution at a fixed pressure of 5 Pa and with an added static magnetized field of ~0.01T: a) 600 W, b) 800 W, and c) 1000 W.