Abstract Submitted
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Modeling and simulation of electromagnetic effects in capacitive discharges MICHAEL LIEBERMAN, UC Berkeley — We present a self-consistent two-dimensional axisymmetric model and simulation strategy for predicting radial plasma uniformity in large-area high-frequency capacitive discharges. The model couples Maxwell equations, fluid plasma equations and a sheath model with stochastic heating effects taken into account, solving the equation using the finite element method (FEM). Electromagnetic effects (e.g. standing wave and skin effects) as well as the electrostatic edge effect appear in our simulation, whose results are in agreement with recent experiments. The model highlights differences between the edge effect and the skin effect, both of which can cause strong plasma production near the radial reactor edge. At higher frequencies and high pressures, we observed the 'stop band' where waves are highly damped as they propagate from the discharge edge into the center. The model enables an investigation into the transition from global-to-local power deposition as the pressure varies. The use of a FEM-based simulation allows for treatments of irregular geometries, as well as the addition of equations describing fluid flow, heat and mass transfer, and chemical kinetics, although we do not include these effects here.

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