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A hybrid model in inductively coupled plasma discharges with bias source: Description of model and experimental validation in Ar discharge[1] DE-QI WEN, WEI LIU, YONG-XIN LIU, FEI GAO, YOU-NIAN WANG, Dalian University of Technology — Traditional fluid simulation and Particle-in-Cell/Monte-Carlo collision (PIC/MCC) are very time consuming in inductively coupled plasma. In this work, a hybrid model, i.e. global model coupled bidirectional with parallel Monte-Carlo collision (MCC) sheath model, is developed to investigate inductively coupled plasma discharge with bias source. The global model is applied to calculate plasma density in bulk plasma. The sheath model is performed to consistently calculate the electric field, ion kinetic and the sheath thickness above the bias electrode. Moreover, specific numbers of ions are tracked and ultimately ion energy distribution functions (IEDFs) incident into bias electrode are obtained from MCC module. It is found that as the bias amplitude increases, the energy width of both IEDFs becomes wider, and the total outlines of IEDFs move towards higher energy. The results from the model are validated by experimental measurement and a qualitative agreement is obtained. The advantage of this model is that plasma density, ion flux and IEDF, which are widely concerned in the actual process, could be obtained within an hour.

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