Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Electric field reversal and electron heating mode transition induced by magnetic field in capacitive oxygen discharges[1] LI WANG, Dalian University of Technology, DE-QI WEN, Michigan State University, YUAN-HONG SONG, YOU-NIAN WANG, Dalian University of Technology — Using a one-dimensional Particle In Cell/Monte Carlo collision (PIC/MCC) model, we investigate the influence of magnetic field on capacitive oxygen discharges. When a magnetic field is imposed parallel to the electrode surfaces, the electron density is significantly increased due to their confinement by the magnetic field and the enhanced ionization efficiency, which is accompanied by a decreased electronegativity. More interestingly, when a driving frequency 13.56 MHz is set, electric field reversal and electron heating mode transition are observed by increasing the magnitude of magnetic field. From a comparison between the results from the PIC simulation and an analytical model, the reversed electric field is found to be induced by Lorentz force. When the discharge is conducted under a high frequency, i.e. 40.68 MHz, high frequency oscillations adjacent to the expanding sheath edges are weakened even disappear with the increase of the magnetic field, compared with the results obtained without applying the magnetic field. The disappearance of the oscillations also accompanied with an evident enhancement of electron heating by the electric field reversal.

[1]This work was supported by the National Natural Science Foundation of China (Grant No. 11675036 and 11275038)

Li Wang
Dalian University of Technology

Date submitted: 31 May 2019 Electronic form version 1.4