Abstract for an Invited Paper
for the GEC10 Meeting of
The American Physical Society

Progress on simulations of multiple-frequency capacitively coupled discharges[1]

ZOLTAN DONKO, Research Institute for Solid State Physics and Optics, Hungarian Academy of Sciences, Budapest, Hungary

While routinely serving in industry for several decades, some details of the physics of capacitively coupled discharges are still to be clarified. This is particularly true for sources driven simultaneously by multiple frequencies, which have been used to realize an independent control of ion properties. Particle simulation studies aid understanding the characteristic phenomena taking place in these plasma sources. We investigate here the time and space resolved dynamics of charged particles in multi-frequency discharges. Our results for "classical" dual-frequency discharges (operated at substantially different frequencies) show a coupling between both frequencies, which finally limits the separate control of ion properties. We find that the separate control is also influenced by secondary electrons to considerable extent. The limitations of classical dual-frequency discharges can be overcome by driving the discharge by consecutive harmonics of a fundamental frequency - in this case the phase shifts between the harmonics act as control parameters of the ion energy.

[1]Supported by the Hungarian Fund for Scientific Research, via Grant # OTKA-K77653, and the Ruhr University Research Department Plasma.