DPP19-2019-000354

Abstract for an Invited Paper
for the DPP19 Meeting of
the American Physical Society

Three-dimensional measurements of fundamental plasma parameters in pulsed ICP operation[1]

JIA HAN, University of California, Los Angeles

Radio frequency inductively coupled plasma sources are widely used in low temperature industrial processing. Having reached a limit in process improvement available with steady state plasmas, the semiconductor industry is turning to temporal modulation of the rf generators in these sources. We performed 3D measurements of fundamental plasma parameters in a pulsed Argon plasma in a modified industrial etch tool. The ICP and bias RF generators are independently pulsed at arbitrary repetition rates and duty cycles. This work reports spatially and temporally resolved probe measurements of fundamental plasma parameters. RF antenna current is switched on in less than 50 micro-seconds. Initially the peak of the electron temperature appears under the antenna, then moves towards the center of the machine. The induced plasma current is primarily concentrated directly under the antenna. At a 1 kHz rep rate, the plasma does not have time to reach a steady state. Nevertheless, the density is always peaked at the center. We also report profile dynamics of pulsed operation at different repetition rates and duty cycle. Results will be presented with and without interleaved sequenced bias voltage.

[1]This work is supported by an NSF GOALI award and performed at the Basic Plasma Science Facility.