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Frequency dependent ion kinetics in a 300 mm dual-frequency capacitively coupled plasma reactor G.A. HEBNER, E.V. BARNAT, P.A. MILLER, Sandia National Laboratories, A.M. PATERSON, J.P. HOLLAND, Applied Materials — Argon ion kinetics were measured in a dual frequency, capacitively coupled 300 mm chamber. Laser induced fluorescence measurements of the argon ion metastable lineshape yield information on the ion temperature, density and drift velocity. The spatially-resolved LIF technique is a nonperturbative probe to investigate energy deposition mechanisms, ion energy distribution functions, charge exchange reactions, neutral heating, and plasma potential gradients within the plasma. This talk will discuss ion characteristics for a single rf frequency drive (13, 60 and 160 MHz), combinations of rf drive frequencies, as well as scaling with pressure (10 – 70 mTorr) , rf power, and radial position. We find that the ion density increased linearly with rf power, as did the electron density, indicating the ion metastable state is formed from direct impact ionization. The ion temperature was on the order of 500 K. Radially resolved ion drift velocity measurements show the radial drift velocity can be lower at 60 MHZ than 13 MHz. Additional details will be discussed.
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Greg Hebner

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