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Temporal Sheath Profiling MICHAEL BARNES, MS Barnes Engineering, WALTER GEKELMAN, PATRICK PRIBYL, UCLA Physics Department, BRETT JACOBS, Applied Materials, Inc. — A Monte Carlo model of an rf plasma sheath was modified to allow sampling in rf phase as a function of height above the surface to which it derives from. The trajectories of argon ions were simulated in the presence of a temporal and spatially varying electric field including elastic and charge exchange collisions using the self scattering (or null collision) technique. The unique observation in this work lies in the transition regime between resistive and capacitive rf sheaths that occurs near the ion plasma frequency. During this transition, the average ion impact energy on the electrode surface significantly exceeds the dc sheath potential. This is also a scalable property as it can be shown to be a function of the sheath scaling parameter, the ratio of the ion transit time to the rf period. Temporal sheath profiling will illustrate the ion energy distribution functions at four phases as a function of sheath distance above the electrode surface. Several frequencies in the resistive, capacitive and transition regimes will be presented to enhance the mechanistic understanding whereby the average ion energy is able to considerably exceed the dc sheath potential. Experimental results from LIF measurements will validate the results of the numerical model.

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