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Fundamental Studies of Pulsed Processing Plasmas KRISTOPHER FORD, JOEL BRANDON, North Carolina State University, KYUNG SUN KIM, Samsung Electronics Co., TYLER LIST, TIANYU MA, PRIYANKA ARORA, University of Houston, SHUO HUANG, University of Michigan, SANG KI NAM, Samsung Electronics Co., STEVEN SHANNON, North Carolina State University, VINCENT DONNELLY, University of Houston, MARK KUSHNER, University of Michigan, SAMSUNG PLASMA TECHNOLOGY JOINT RESEARCH LABORATORY COLLABORATION — Pulsed plasmas present new opportunities for semiconductor processing, which include unique chemistries, reduced substrate heating, and decreased charge damage. Transient plasmas also present new challenges compared to constant power delivery systems due to their dynamic behavior. Power delivery, diagnostics, and simulation tools must provide μs-scale time resolution and response. System measurement and control on this time scale not only ensures repeatable process conditions; it also enables new process control and optimization methods. This work reviews time resolved characterizations efforts on inductively coupled plasmas that focus on system characterization, chemistry, and plasma surface interaction using an array of diagnostics (optical emission, Langmuir probe, microwave hairpin, fast CCD imaging, RF measurement) along with pulsed RF simulation in the HPEM framework. Time resolved measurements of n_e, T_e, V_p, V_f, V_{RF}, I_{RF}, and optical emission will be presented together with simulation cases. From these studies, compelling pathways for transient plasma control and optimization will be presented.

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