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Ignition conditions for peripheral plasma in a grounded chamber connected to a dual frequency capacitive discharge SUNGJIN KIM, M.A. LIEBERMAN, A.J. LICHTENBERG, University of California, Berkeley, J.T. GUDMUNDSSON, University of Iceland, Reykjavik, Iceland — A capacitive discharge connected through a slot to a peripheral grounded pumping region is a configuration of both theoretical and practical interest. It is used in commercial dual frequency capacitive discharges with one frequency higher than the usual industrial frequency of 13.56 MHz, with application to dielectric etching. In some configurations a dielectric slot surrounding the substrate separates the main plasma from a peripheral pumping region. Ignition of the peripheral plasma produces detrimental effects on processing performance. Discharge models for diffusion and plasma maintenance in the slot have been developed to obtain conditions for ignition of the plasma in the periphery. We found that, depending on the discharge conditions, either maintenance of the slot plasma or the periphery plasma determines the loss of confinement in the system. An experiment has been constructed to compare with and validate theoretical predictions of ignition conditions. We observed a significant hysteresis in the loss of confinement and ignition of the peripheral and slot plasmas, which can be explained qualitatively by our model theory. Support provided by Lam Research, the state of California MICRO program, NSF Grant ECS-0139956, and UC Discovery Grant from IUCRP.

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