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Seasoning of Plasma Reactors: Feedback Control Strategies to Counter Wafer-to-Wafer Drifts[1] ANKUR AGARWAL, University of Illinois, MARK J. KUSHNER, Iowa State University — Seasoning of plasma etching reactors is the deposition of materials on wafers and surfaces of the chamber resulting in process or wafer-to-wafer drift in etch rates or uniformity. Feedback control with *in situ* diagnostics is being investigated to combat this drift. The Virtual Plasma Equipment Model, an implementation of sensors, actuators and control algorithms in the HPEM, was used to investigate real-time and wafer-to-wafer control strategies. The model system is Ar/Cl_2 etching of Si in an inductively coupled plasma reactor. The passivation of surfaces in contact with the plasma, including the deposition of etch products, change reactive sticking coefficients and produce etch blocks which in turn affect etch rate. Sputtering of dielectrics may introduce additional etch-block capable species. A PID controller was used to vary the bias voltage in response to an etch rate monitor to enable control of etch rate. We found that control is problematic at high bias voltages where the flux of etch products from the wafer is sufficiently large that plasma properties are affected and redeposition increases etch blocks on the wafer. Multiple sensors-and-actuators may be necessary when sputtering of dielectrics produce additional etch-block species.

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