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Atomic Layer Etching of SiO2 and Other Materials Using Decoupled Plasma Process Sequences GOTTLIEB OEHRLEIN, University of Maryland — An approach that uses steady-state Ar plasma in conjunction with periodic injection of a defined number of C_4F_8 molecules and synchronized plasma-based Ar^+ ion bombardment, Angstrom-level precision in etching of SiO_2 is possible.[1] The physical sputter rate of SiO_2 vanishes for low energy Ar^+ ion bombardment conditions giving a maximum ion energy of about 20eV. On the other hand, for an FC-coated SiO_2 surface, chemical modifications of the SiO_2 surface are induced by low energy ion bombardment and SiO_2 etching is initiated. We will discuss the temporal variation of the chemically enhanced etch rate of SiO_2 for Ar^+ ion energies below 30 eV as a function of fluorocarbon surface coverage which enables controlled removal of Ångstrom-thick SiO_2 layers per process cycle. We will also review results on the extension of this approach to etching of silicon and overview challenges connected with controlling low pressure plasma surface interactions for the achievement of atomic scale precision in etching materials for pattern transfer. [1] D. Metzler, R. Bruce, S. Engelmann, E. A. Joseph, and G. S. Oehrlein, J Vac Sci Technol A **32**, 020603 (2014) * Based on collaborations with D. Metzler, C. Li, S. Engelmann, R. Bruce, E. Joseph, E. Godyak, and M. Kushner. We gratefully acknowledge funding from National Science Foundation (CBET-1134273) and US Department of Energy (DE-SC0001939).

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