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Etching with Electron Beam-Generated Ion-Ion Plasmas S.G. WALTON, D. LEONHARDT, M. LAMPE, R.F. FERNSLER, US Naval Research Laboratory — The advantage of positive ion-negative ion (ion-ion) plasmas in etching processes is the delivery of anisotropic fluxes of *both* positive and negative ions to the substrate surface, which is thought to prevent device damage and isotropic etch profiles associated with surface charging. Unfortunately, the low electron temperature required for ion-ion plasma formation in halogen-based gases is typically found only in the afterglow of pulsed plasmas, thereby limiting the duration and magnitude of the useful flux. Electron beam-generated plasmas are characterized by low electron temperatures (<1.0 eV) during all phases of plasma production and can thus provide a continuous ion-ion plasma. In this work, we discuss silicon etching using these ion-ion plasmas produced in Ar/SF₆ mixtures. System operation and diagnostics are presented and correlated to a theoretical model (See paper by M. Lampe et al.). Silicon etch rates as a function of various input parameters will also be discussed. This work was supported by the Office of Naval Research.

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