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Surface Modification of Polymer Photoresists in Fluorocarbon Plasma Etching[1] MINGMEI WANG, Iowa State University, MARK KUSHNER, University of Michigan — In plasma etching of high aspect ratio (AR), nm sized features, erosion of polymer photoresist (PR) can perturb the feature profile (e.g., bowing). Although cross-linking of PR due to ion and VUV fluxes could make it more resistive to etching, typically the PR etch rate is too high to maintain the pattern when the AR is large (> 20). In dielectric plasma etching using fluorocarbon gases, one strategy to prevent PR erosion is to deposit a $(C_xF_y)_n$ polymer on its surface. This process may be enhanced in dc-augmented capacitively coupled plasmas (CCPs) by sputtering of Si and C_xF_y from the dc biased electrode. Dangling bonds generated on the PR surface by ion, photon or electron bombardment trap Si and C_xF_y radicals forming Si-C and C-C bonds. Sputtered Si atoms can also react with C_xF_y radicals to produce more reactive C_xF_{y-1} radicals which are more easily incorporated into the PR. In this talk we discuss scaling laws for radical production derived from a computational investigation of a dc-augmented dual frequency CCP reactor sustained in $Ar/C_4F_8/O_2$. Fluxes of Si radicals are produced by sputtering of the dc electrode. Rates of polymer deposition on and sputtering of PR, and consequences of PR erosion (and deposition) on feature profiles will be discussed.

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