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Effect of bombarding ion energy distribution on ion/surface interaction during fluorocarbon plasma etching[1] AMY WENDT, SHUNTEL WILLIAMS, YUK-HONG TING, University of Wisconsin-Madison, SATOSHI HAMAGUCHI, Osaka University — In earlier studies, etch rate measurements in fluorocarbon plasmas showed a surprisingly significant dependence of fluorocarbon etch/deposition rate on the energy *distribution* of bombarding ions (IED). Understanding this result has implications for the many etch processes that depend on selective fluorocarbon deposition to control etch selectivity. Toward this end, an analysis was conducted of the nonlinear effects resulting from ions of different energies interacting with a surface simultaneously. The analysis made use of available data on the interaction between fluorocarbon ion beams of single fixed energy interacting with a silicon surface. The outcome was a simple model that illustrates and quantifies an important nonlinear effect: specifically, that the effect of ions of a particular energy on the substrate is sensitive to the presence of ions of other energies. The etch/deposition rate resulting from ions of different energies reaching the substrate simultaneously is not just the linear combination of the rates resulting from ions of each energy interacting with the surface on their own. The nonlinearity arises from differences in the chemical composition of the interaction region at the surface of the substrate, resulting from changes in the IED.

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