Abstract Submitted
for the GEC07 Meeting of
The American Physical Society

Analysis of plasma-surface interactions during plasma etching by in-situ diagnostics of reactants and reaction products YOSHINORI UEDA, MASAHIRO YOSHIDA, KOJI ERIGUCHI, KOUICHI ONO, Kyoto University —
The incoming ions and neutrals onto substrate surfaces govern the etching characteristics achieved; moreover, the product species, desorbed from the substrate being etched, also play an important role in processing. This paper presents a mechanistic study of plasma etching processes, using in-situ plasma and surface diagnostics of reactants and reaction products, to gain a better understanding of competitive mechanisms that occur during etching. Experiments were performed primarily in an inductively coupled plasma reactor, with emphasis being placed on Si etching with Cl_2/O_2 chemistries and on HfO_2 etching with $BCl_3/Cl_2/O_2$ chemistries. Optical emission spectroscopy, laser-induced fluorescence spectroscopy, and quadrupole mass spectrometry were employed to observe reactant and product species in the gas phase. Fourier transform infrared absorption spectroscopy was also employed, to observe triatomic and larger molecules of reactants and reaction products in the gas phase and on surfaces; in practice, the gas-phase species was observed by transmission absorption spectroscopy, and the product species such as $SiCl_x$ and $HfCl_x$ on the surface by reflection absorption spectroscopy. The mechanisms responsible for selective etching of Si over SiO_2 and of HfO_2 over Si are discussed based on these observations.

Yoshinori Ueda
Kyoto University

Date submitted: 15 Jun 2007 Electronic form version 1.4