GEC15-2015-000532

Abstract for an Invited Paper
for the GEC15 Meeting of
the American Physical Society

Plasma-surface interactions for top-down and bottom-up nanofabrication

KOUICHI ONO, Kyoto University

Plasma processing is now widely employed for the fabrication of nanostructures in diverse fields of micro/nanoelectronic, optoelectronic, energy conversion, and sensing devices. The top-down plasma processes are indispensable in today's microelectronics industry, relying on the use of primarily anisotropic plasma etching following the lithography to define mask patterns; in some cases, self-assembled masks are served for the subsequent etching. The bottom-up ones are often employed to synthesize nanostructures such as nanotubes and nanowires, relying on the use of plasma enhanced chemical vapor deposition and plasma sputtering on self-assembled as well as lithographically formed patterns of metal catalysts. Moreover, the mask-less top-down approaches have recently been demonstrated to form nanopillars and periodic nanoripples, and the catalyst-free bottom-up approaches have been demonstrated to form nanowires. This talk is concerned with the current understanding and future prospects for plasma-surface interactions responsible for these top-down and bottom-up plasma nanofabrication processes, with attention placed on the fabrication of nanoscale fins and gates and also nanowires of silicon. On nanometer scale, ions and neutrals incident on surfaces are few in number during processing; thus, the nanoscale plasma-surface interactions concerned are stochastic, owing to the temporal as well as spatial uniformity of the incident flux and angle of them on surfaces being processed at nanoscale.