Multiscale simulation of plasma etching process from molecular interactions to feature profile

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With the continuous decrease in nanoscale design dimensions, semiconductor plasma processing must confront the limits of physicochemical fabrication routes at the atomic scale. Especially, one of the emerging challenges with plasma etch is to understand their inherent complexities with synergetic effects of scattering and sputtering behaviors including steric constraints and non-local effects in surface chemistry, leading to development of cost-effective plasma processes for next generation semiconductor devices. To address this issue, this work present a coupling research between molecular dynamics (MD) simulation and nanoscale feature simulation. It is demonstrated that the 3D feature profile evolution simulations coupled with MD results can be one of best ways to capture key clues to understand the realistic behaviors for next generation plasma etch processes (line & space, or UHARC) in semiconductor industries.