Advanced 3D feature profile simulation for realistic plasma etch studies

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With continuous decreases of critical dimension up to below 10 nm in semiconductor industries, one of the emerging challenges with plasma etch is to achieve the ideal ultra-high aspect ratio contact hole. To date, next generation development of these processes still depends on trial and error instead of computer-aided methods due to absence of highly reliable simulation tools. To address these issues, a 3D feature profile simulator, which was named as K-SPEED, has been developed by a plasma consortium in our country since 2009. This simulator is coupled strongly with global reactor and nano feature scale simulations including realistic plasma/surface chemistries. In this work, novel advanced technologies such as effective coupling approach between reactor and feature scales, and various parallel computing technologies are introduced in order to make realistic engineering interpretation possible. Finally, several case studies for recent plasma processes will be demonstrated.