Plasma surface reaction modeling coupled with global bulk plasma model in fluorocarbon plasmas

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As the critical dimension continues to decrease up to few tens nanometer, it is getting more critical issue to obtain the ideal etch profile in plasma processing due to the complexity of surface reaction mechanism. Unfortunately, plasma engineers still depends on their empiricism instead of the scientific approach. As an effort to address this issue, we present the predictable zero dimensional modeling approach that are coupled strongly with plasma surface reaction and bulk plasma modeling for fluorocarbon etch plasma. For this work, plasma diagnostic for bulk plasma and surface reaction in inductively coupled fluorocarbon plasma was performed by qudrapole mass spectrometry, langmuir probe, cut-off probe and silicon oxide etching. Based on these experimental data, key information such as rate coefficient and reaction paths for realistic bulk and surface plasma chemistries could be obtained in this work. Finally, we will demonstrate that this modeling approach is useful and effective route to predict the complex plasma phenomena in fluorocarbon plasma etching process.