Abstract Submitted
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Atomic layer etching of SiO_2 under Ar/ C_4F_8 plasmas with pulsed bias[1] SAI-QIAN ZHANG, ZHONG-LING DAI[2], YOU-NIAN WANG, School of Physics and Optoelectronic Engineering, Dalian University of Technology, PLASMA SIMULATION AND EXPERIMENT GROUP (PSEG) TEAM — The purge steps in the atomic layer etching (ALE) reduce the throughput and increase the costs. By elaborately choosing bias pulse waveforms, ALE can be achieved without alternating feedstock gas, although compromises are needed between throughput and precision. In this study, a multi-scale model is used to simulate ALE of SiO_2 with a pulsed bias in Ar/C_4F_8 plasmas. Firstly, a commercial software CFD-ACE+ is used to calculate the reactant fluxes towards the substrate in a CCP reactor. The ion bombardment energy and angular distributions at substrate are calculated with a hybrid sheath model, where electric field is got from fluid equations, and the ion-neutral collisions are considered applying the Monte Carlo(MC) method. Then, the reactant transport and surface MC reaction algorithm are coupled in a feature scale model. Influences of bias pulse frequency and duty ratio on atomic precision control are studied. Also, comparisons are made between conventional ALE and pulsed bias etching. Results show that when pulsed bias is used instead of alternating the feedstock gas, we can still achieve certain self-limiting nature in etching, with higher throughput and acceptable loss of precision.

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[2]corresponding author: daizhl@dlut.edu.cn

Zhong-Ling Dai
School of Physics and Optoelectronic Engineering,
Dalian University of Technology

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