

GPU computing platform for ballistic transport in 3D feature profile simulation of plasma etching process

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Recently, one of the critical issues in plasma etching processes is to accomplish ideal deep contact hole profile without abnormal behaviors such as sidewall bowing and randomly twisted profile. As part of effort to overcome this issue, we have developed three dimensional topography simulator to predict realistic etch profile before etch process, which is named as 3D-SPEED. This simulator developed in previous works of our group was composed of multiple level-set based moving algorithm and ballistic transport module, and surface reaction module. For this simulation, one of main bottlenecks is a brute force computation time to consider realistic ballistic transport of ions and neutral species in nanoscale feature profile, which makes it difficult to perform real time computer simulation. To overcome this critical issue, we introduce GPU based parallelization strategies that have been well known as one of the fascinating platforms for a parallel computing platform. Finally, it is demonstrated that ultra-high aspect contact hole etching simulation leading to massive computation can belong to scope of real-time computation.