

Multi-GPUs based 3D feature profile simulation for fluorocarbon plasma etch process

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In the semiconductor industry, the more the nano-scale plasma etching process is to accomplish ultra-high deep contact hole, the more difficult the abnormal profiles such as sidewall bowing and necking are predicted. Furthermore, the predictable modeling for the plasma etching process needs heavy computations due to inherent complexities of plasma process. As an effort to overcome this issue, we have developed real-time 3D feature profile simulation using GPU computing technology. The 3D feature profile simulation is composed of level set algorithm, ballistic transport module and surface reaction module. However, in this simulation, it is recognized that the brute-force computation is required for consideration of realistic ballistic transport module. The goal of this work is to develop robust and ultra-fast ballistic transport module of ions and neutrals using multiple GPUs in the 3D feature profile simulator. Finally, we demonstrated real-time 3D feature profile simulation for ultra-high aspect contact hole etching under fluorocarbon plasma.