

78. Three-Dimensional Topography Simulation Based on a Level Set Method

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To understand the influence of edge topography on device characteristics, which is important for highly integrated ICs, an accurate three-dimensional topography simulator is required. The most well-known topography simulation models are the string model, the cell-based model, and the level set model. The string model needs segment controls which are very difficult to handle and require long computation times in the three-dimensional case [1]. With a cell-based model it is difficult to obtain smooth surfaces, and calculating the surface normals leads to accuracy problems [2]. The level set method [3, 4], on the other hand, provides an interesting method for solving these problems.

Based on an efficient and precise level set method including narrow banding and extending the speed function in a sophisticated algorithm, we have developed a general three-dimensional topography simulator for the simulation of deposition and etching processes. The simulator is called ELSA (Enhanced Level Set Applications). It consists of three modules. The first one is for transport of the species, the second one is responsible for surface reaction, and the third one is a level set module for evolution of the surface. ELSA works efficiently concerning computational time and memory consumption, and it simultaneously ensures high resolution.

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