Adaptive Simulation of Dopant Diffusion in Silicon

Jens Lang
lang@zib.de
ZIB, Germany

One important step in the fabrication of silicon–based integrated circuits is the creation of semiconducting areas by diffusion of dopant impurities into silicon. Complex models have been developed to investigate the redistribution of dopants and point defects. In general, numerical analysis of the resulting PDEs is the central tool to assess the modelling process. In this talk, an adaptive approach is presented, which is able to judge the quality of the numerical approximation and which provides an automatic mesh improvement [1]. Using linearly implicit methods in time and multilevel finite elements in space, we are able to integrate efficiently the arising reaction–drift–diffusion equations with high accuracy. Two different diffusion processes of practical interest are presented [2].

[1] J. Lang, Adaptive multilevel solution of nonlinear parabolic PDE systems. Theory, algorithm, and applications, Lecture Notes in Computational Science and Engineering 16, Springer–Verlag, Berlin, Heidelberg, New York, 2000

[2] J. Lang and W. Merz, Two–dimensional adaptive simulation of dopant diffusion in silicon, Comput. Visual Sci., 3, 169–176 (2001)