W.Jüngling, S.Selberherr (20min. talk)

Modeling and Simulation of IC-Fabrication Steps

A survey of the activities at the Technical University of Vienna will be presented. Efficient simulation tools and accurate modeling are necessary to keep pace with the steadily increasing complexity of IC-fabrication techniques. We will present the 1-dim and 2-dim process simulators ZOMBIE and PROMIS. These programs permit in an easy way the exchange of physical models and quantities of interest. ZOMBIE has especially been designed for the improvement and development of new models (e.g. phosphorus diffusion, field-enhanced diffusion etc.). The major advantage of ZOMBIE versus PROMIS lies in the significantly more efficient computer resource utilization due to the fact that only one space dimension is considered. Therefore model evaluation and comparison to (1-dim) measurements can be carried out much quicker. PROMIS is the 2-dim version of ZOMBIE. This program can simulate the mentioned physical models in two dimension which exceeds by far the capabilities of existing process simulators. Typical applications and results will be presented like the simulation of oxidation enhanced diffusion, various models of gold diffusion in silicon or the interaction between intrinsic point defects in silicon and dopants during diffusion. Both programs permit the results of measurements or prior simulations to be the initial solution for further simulations. The results of one- and two-dimensional Monte-Carlo simulations of ion implantations in crystalline and amorphous material, which have started at our University, can therefore be easily connected to all process and device simulations. A secure numerical environment is necessary for the development of new models since critical domains in space and time during the simulation can often not be estimated in advance. Fully adaptive spatial and transient grid for the simulation are therefore implemented into the simulation tools. These features free the user from many numerical aspects of simulation and reduce CPU-time and memory requirements.