SURFACE ANALYSIS

1. Effect of interface excitations for electrons in Monte Carlo simulations

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The inelastic mean free path (IMFP) is the key parameter for Monte Carlos simulations of electron trajectories in solid materials. In most of the cases the IMFP is defined for infinite medium, but for very thin layers as developed today in transistors, this approximation is no more valid. Indeed, interface excitations could play a non-negligible role in energy losses and thus in electron paths. The solution is to use a local IMFP considering interface excitations and thus depending on electron position.

The goal of this work is to develop Monte Carlo simulations considering these interface excitations. The difficulty will be to develop a sampling technique that takes into account the local IMFP. The first type of simulations will only consider a simple interface, while other calculations will try to simulate reflection-electron-energy-loss spectroscopy (REELS) experiments, i.e. experiments in which energy losses of electrons reflected from a surface are measured.

A final option would be to develop theoretical calculations of interferences between two close interfaces in spherical coordinates. Indeed, calculations of interference effect have been performed up to now in cylindrical coordinates, which do not completely satisfy energy and momentum conservation laws.