COMPUTER SIMULATION OF ION-SOLID INTERACTION PROCESSES

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Application of grazing angles of incidence of ions on the solid surface opens new perspectives in investigation of composition, structure and topography of real surfaces and their modification and polishing by ion beams.

In present work the peculiarities of ion-solid interaction processes have been investigated by computer simulation. The present code is based on the binary collision approximation by using Newton equation for construction of trajectories of colliding particles. For description of interaction between particles the universal Biersack-Littmark-Ziegler potential is used. Both elastic and inelastic energy losses are taken into account. The inelastic energy losses are considered as local. The scattering integral is solved numerically using quadratic Gauss method. Thermal vibrations of lattice atoms are considered as randomize on Gauss distribution. Computer code described by Pascal allows observing the dynamics of ion-solid interaction processes.

Ion scattering, sputtering and implantation into the Cu(001) and GaAs(001) surfaces under conditions of low-energy ion bombardment at grazing incidence have been investigated. The depth distributions of 5 keV Ar ions implanted into Cu(001) surface and 1 keV Be and Se ions implanted into GaAs(001) have been calculated.

The obtained results allow to select the optimum conditions for layer-by-layer sputtering and obtaining implanted depth distributions with demanded shape in narrow near-surface area (5-10 atom layers) of crystals. Application of present code for investigation of diagnostics and modification of solid state surface is discussed.