

“Investigation of modern semiconductor nanodevices and nanocomponents of integral circuits, based on 1D and 2D structures”

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Results

Estimations for the dynamical properties of tree-nitrides compounds (InN, GaN, AlN) were obtained, using semi-analytical expressions for momentum and energy mean free times in strong fields. Field-temperature dependences, occupation of the valleys, velocity-field characteristics in strong fields with different modifications of crystal lattice (cubic and hexagonal) were calculated. These results were compared with existent experimental data, calculated by other authors. Simulation programs, calculating electrophysicals and schematic parameters of the modulation doped heterotransistors with quantum dots, built into the channel with 2D electron gas were developed. It was shown that such transistors shows enhanced 2D electrons concentration and mobility due to electrons, injecting from heterojunction as well as electrons from quantum dots. Model of field effect transistor with nanotubes were developed as well. Simulation programs for resonant-tunneling diode (RTD) were developed. They based on self-consistent Shrodinger-Poisson equations for envelope function and allow modeling RTD with nano-sized layers of semiconductor compounds, formed RTD.

Theoretical results of investigation were adopted into educational process in special courses “Physics of electrons processes”, “Nanoelectronics fundamentals”, “Ultra-high-speed electron devices”. Two Ph.D. theses were prepared and passed to specialized Academic Senate. Technical solution were developed and passed to such enterprises as “Saturn”, “Orion”, “Mirrad” (all are Kiev enterprises).