Model Doping Quantum Dots InAs with Bi Impurity by Low-Temperature CVD-Metods

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Growth of $In_xGa_{1-x}As/GaAs$ heterostructures with embedded arrays of quantum dots (QD) InAs CVD-metods at low temperatures is actual to the needs of nanoelectronics. QD InAs in GaAs matrix is formed by Stranskij-Krastanow mechanism. Growth kinetics and stress distribution in the QD matrix affects the size, shape and location in the matrix [1]. One of the management practices of forming homogeneous coherently deformation InAs QDs is their isovalent impurity doping Bi [2]. Therefore creation of model concepts of formating mechanism of of InAs QDs in GaAs matrix in their isovalent impurity doping Bi at low temperature CVD-metods is scientific novelty.

Epitaxial growth in gas transportation systems is determine by delivery processes of reactive components by gas stream and by the kinetics processes on the substrate. The purpose of this work is to create the mathematical models and numerical algorithms that allow us to investigate the gas-dynamic processes in the chloride system in horizontal gas-transportation reactor.

On the basis of model representations described [3] the growth model of GaAs/InAs(Bi) is constructed for a low temperature CVD-metods. The theoretical model of hetero nanostructures $GaAs/InAs(Bi)/In_xGa_{1-x}As$ growth for low temperature CVD - method is obtained. The model is based on the description of the gas dynamics and kinetics of surface processes of growth $GaAs/InAs(Bi)/ In_xGa_{1-x}As$ hetero nanostructure. The model makes it possible to quantify the change in the rate of growth $GaAs/InAs(Bi)/In_xGa_{1-x}As$ hetero nanostructure. Model also allows to determine the concentration of isovalent doping quantum dots of InAs with Bi admixture along the GaAs substrate in direct-flow horizontal reactor. From the analysis of surface processes kinetics, according to the model representation, the changes in growth rate of heteronanostructures of $GaAs/InAs(Bi)/In_xGa_{1-x}As$ and isovalent doping of InAs QDs by Bi-dope along the GaAs substrate in horizontal straight-through reactor wer quantitatively found out. The effects of input component concentration in the gas phase, the flow rate of gas-carrier H_2 and the distribution of the temperature profile along the substrate GaAs on these values were determined.

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