2. Nanocomposites and nanomaterials
Peculiarities of the Electron Transport in Nanocomposite Films of Silicon Nanocrystals

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Today, much attention is devoted to the properties of silicon nanostructures in connection with the trend of miniaturization of modern electronics devices The unique properties of nanocomposite silicon layers allow to us to create the devices for different purposes on their basis: emitters, photodetectors, chemical and biological sensors, photonic crystals, and others. Electron transport processes are not yet fully clarified, and it indicates the necessity to further research the electron processes in nanocomposite SiO_2(Si) films [1,2].

The nanocomposite SiO_2(Si) silicon nanocrystal films containing dielectric matrix SiO_2 was formed during the high-temperature annealing of ion-plasma sputtered SiO_x films [3] at T = 1100 °C for 30 min in N_2 atmosphere. Two types of nanocomposite SiO_2(Si) films were investigated. At formation at one of them the stoichiometry index of initial SiO_x film was $x_1 = 1.3$, and for another one it was $x_2 = 1.1$.

To define the mechanism of electrical conductivity, the *I–V* characteristics were measured at various temperatures, and the dependence of current from voltage in different coordinates was analyzed.

The investigations of electron transport through nanocomposite SiO_2(Si) silicon nanocrystal films containing Si nanocluster in dielectric SiO_2 matrix enabled to determine the electron transport mechanism. The current flow was realized by variable-range hopping through the traps near of the Fermi level. It allows us to determine the some parameters of electron traps taking part in the current transport [1-3].

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