

Peculiarities of charge transfer in SiO₂(Ni)/Si nanosystems

The work is devoted to the study of peculiarities of charge transfer in SiO₂(Ni)/Si nanosystems formed by the electrochemical deposition of nickel into the pores of the ion-track silicon oxide template on silicon. SiO₂/Si template was formed using the swift heavy ion tracks technology, which includes irradiation with high energy ions and chemical transformation of the obtained latent tracks into the pores. The preparation of SiO₂(Ni)/Si nanostructures with different filling degree of pores in SiO₂ with nickel was performed using the electrodeposition method by changing the duration of the process. A study and analysis of the morphology of SiO₂(Ni)/Si nanostructures using scanning electron and atomic force microscopy was carried out to determine the nature of pore filling by metal.

Special attention is given to experimental studies of the current-voltage characteristics of SiO₂(Ni)/Si nanosystems and analysis of the results in the context of the band structure and physical properties of dielectric on semiconductor systems with metallic inclusions in the dielectric matrix. The potential barrier value on the Si/metal interface in the pores of the silicon oxide template was determined and dependence of its change on decreasing temperature was shown. On the base of these results peculiarities of charge transfer in SiO₂(Ni)/Si nanosystems in various temperature ranges were discussed. Studies of objects with nanosized metallic inclusions allow to systematize electrophysical and galvanomagnetic properties that can become a basis for designing of new types of electronic and sensoric devices.

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Track Classification: Applied Research