for Si and SiO_2 band) led to understanding the way in which pre-exposure of the substrate affects the subsequent CVD.

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NANO-50(2)

Localization of ionizing radiation using nanoporous alumina matrices

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All living organisms on the earth are exposed to radiation – from natural or industrial radiation to radiation used for medical diagnosis or treatment.The reaction of a living organism on the radiation depends on the type, dose and time of such exposure, as well as on the surface area of the body subjected to irradiation.The growth rate of living systems at the micro level is very high, so it is often difficult to identify the effects of various factors on them at an early stage.

Studies of the effect of ionizing radiation on living systems at the micro level with the help of a localized effect of high-energy ion beams are relevant. The study of the effect of radiation on biological objects at the micro level will reveal possible mutational changes in the living systems under study at the initial stages. The ability to select the type of ions with controlled doses will facilitate the effective conduct of studies and production of reliable results.

In this regard, the development of ceramic capillary matrices and the study of the principles of focusing ion beams with their use is topical.

The paper deals with the transportation ion beam to the object of investigation. It is shown that porous anodic aluminum oxide is in its structure an ideal dielectric matrix of nanocapillaries. Due to the small angular scattering it allows transportation of the accelerated charged particle beams through the dielectric capillaries, and, as a result, localization of high-energy ionic effects.

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NANO-50

Black antireflection composite coatings based on nanostructured carbon-containing anodic alumina

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The surface geometry and microstructure of the absorbing layer strongly influence on the characteristics of antireflection coatings. To this aim the structure of materialshould be optimized and include an array of deep depressions (hollow cylinders, tubes, etc.).In this case, the effect of multiple reflection of radiation falling in directions close to the normal to the surface will take place and with each act of reflection, part of the radiation will be absorbed by the material. Multiple reflection leads to an increase in the effectiveabsorption of radiation into the material in general.

From this point of view, the synthesis of composite porous anodic alumina (PAA) [1,2] containing various carbon components, including amorphous carbon, is a promisingway for creation of selectively absorbing coatings with antireflection properties. A network of localized carbon clusters, separated by thin dielectric layers of PAA, canprovide such material with unique selective optical properties.The nanoporous structure of such composite material with an array of nanoscale channels will entailhigh absorption efficiency inthespectralrangeofsolarradiationof0.3 ... 3 μm. At the same time, the layers of PAA surrounding the carbon clusters block the output of thermal radiation (infrared radiation from the medium-wave region) from the surface of the composite material to the surrounding space, which ensures ensure high selective-absorbing optical properties of the heat-sensing surface.

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Conductive coatings on flexible electrospun substrates by vacuum magnetron sputtering for implantable electrodes

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Currently there is a vast research on all kinds of flexible electronic devices, demanding new substrates and conductors. One of important applications for such structures is implantable electronics, particularly for device-tissue electrical contacts, where biocompatibility is essential, and other factors such as permeability is desirable. Most of existing technologies are rather complicated and/or requiring use of dangerous chemicals.

Here we propose use of vacuum magnetron sputtering method for depositing conductive metal (Ti) coatings on top of nonwoven electrospun polymeric substrates made of polyacrilonitrile (PAN). Substrates can be prepared of various polymers by electrospinning process which enables introduction of desired properties and functions. PAN was used as a simple model polymer, and Ti was chosen as biocompatible conductive material widely used in today's implantable devices.

Together with resistivity of coatings, their morphology and chemical composition are studied by means of scanning electron microscopy and secondary ion mass spectrometry. Properties of coatings obtained at varied sputtering power/constant deposition time on proposed substrate and commonly used polyethylene terephthalate solid films are compared. With highly branched structure and rather deep metal penetration, coatings on nonwoven substrates possess rather high resistivity, which is also attributed to significant oxide containment due to quite high surface/volume ratio. Morphology of branched metal "mesh" coatings on polymer matrix after its dissolution is also studied.

Further, the substrates' biocompatibility was tested on laboratory rats in experiments where the structures were stitched to spine nerve after neuroraphy surgery for one month. Nerve restoration was assessed by histological investigation and electroneuromiography and compared to process in control animals (with neuroraphy but without the stitched structure). Work was supported by grant No.17-79-20243 of Russian Scientific Foundation.