

BLACK NANOSTRUCTURED SILICON IS A MODERN MATERIAL FOR PHOTONICS AND NANOELECTRONICS

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Black silicon is the focus of the research interest of many scientists around the world, both in terms of studying its fundamental properties and in connection with the emerging prospects for a wide range of applications. Interest in this material, which has a small (up to 1%) reflection coefficient in the visible range, is associated with the prospects of creating a new generation of efficient photovoltaic current sources on its basis. Method of stain etching of the surface of single-crystal silicon allows to obtain homogeneous nanostructured layers of black silicon with thickness to 60 nm and is a simple way to modify the photonic properties of silicon nanostructures in a wide range. The surface morphology of black nanostructured silicon was investigated using a scanning tunneling microscope. The influence of nanostructured silicon film thickness on its anti-reflective characteristics was studied. It was found that the best anti-reflective characteristics have samples of black nanostructured silicon with a thickness of 35 nm. The formation of black nanostructured silicon on a textured surface leads to a decrease in the reflective characteristics of the surface and an increase in the conversion efficiency of finished silicon solar cells. The presented method is an effective and inexpensive way to texture the surface of monocrystalline silicon to obtain black silicon layers with different morphology and distribution of chemical elements while being fully compatible with the silicon planar technology used in the production of semiconductor devices. Created mini power converters based on a black nanostructured silicon film, and their panels can be integrated into electronic circuits and ready-made chips for various purposes with low power consumption. The latter opens up the possibility of using black nanostructured silicon in photonics, photoelectric devices, biophotonics, and biosensors.

Topics

Session D. Biomedical optics and sensors technology

Primary authors: Dr MELNICHENKO, Mykola (Department of Mechanics and Mathematics, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine); Dr SVEZHENTSOVA, Kateryna (Department of Physics and Technology of low-dimensional systems V.E. Lashkarev Institute of Semiconductor Physics NAS of Ukraine Kyiv, Ukraine)

Presenter: Dr MELNICHENKO, Mykola (Department of Mechanics and Mathematics, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine)

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