Nanooptics and nanophotonics

Light-emitting of CdS nanocrystals on the oxidized macroporous silicon structures

L. Karachevtseva[1], O. Lytvynenko[1], S. Kuchmiy[2], A. Stroyuk[2], K. Konin[1], O. Sapelnikova[1], E. Stronska[1]

[1] Department of Photonic Semiconductor Structure, V. Lashkaryov Institute of Semiconductor Physics, Natl. Acad. of Sci. of Ukraine. Prospect Nauki, 41, Kiev-03028, Ukraine.
E-mail: lakar@isp.kiev.ua

[2] Photochemistry Department, L. Pisarzhevsky Institute of Physical Chemistry, Natl. Acad. of Sci. of Ukraine. Prospect Nauki, 31, Kiev-03028, Ukraine.

Light emitting nanocrystals on oxidized silicon macroporous matrix are promising for the development of sources of "white" light, completely inorganic multicolor LEDs, light concentrators, waveguide amplifiers and lasers for micro and nanophotonics. Surface modification of macroporous silicon allows the creation of million built-in functional channels that have great potential for design of optical components in microdevices.

Effective light emitting structures of CdS nanocrystals on the oxidized macroporous silicon surface were manufactured. High photoluminescence intensity was obtained due to increasing the flow of electrons from the silicon matrix in the direction of the nanocrystal layers at the maximum of the electric field on the boundary of Si-SiO_2 [1,2], which significantly reduces the rate of nonradiative recombination.

The photoluminescence quantum yield of CdS nanoparticles on the surface of oxidized macroporous silicon with optimum thickness of SiO_2 layer increases of 3-4 times during the first 2 weeks due to evaporation of water molecules from the nanoparticles in the polymer layer and reaches 28%. With further storage of samples range and photoluminescence quantum yield almost no change.

1. *Karachevtseva L., Kuchmii S., Lytvynenko O., Sizov F., Stronska O., Stroyuk A.* Oscillations of light absorption in 2D macroporous silicon structures with surface nanocoatings // Applied Surface Science-2011.-**257,** N8 -P.3331–3335.
2. *Karachevtseva L., Goltviansky Yu., Kolesnyk O., Lytvynenko O., Stronska O.* Wannier-Stark effect and electron-phonon interaction in macroporous silicon structures with SiO_2 nanocoatings // Opto-Electronics Review-2014.-**22,** N4-P. 201-206.