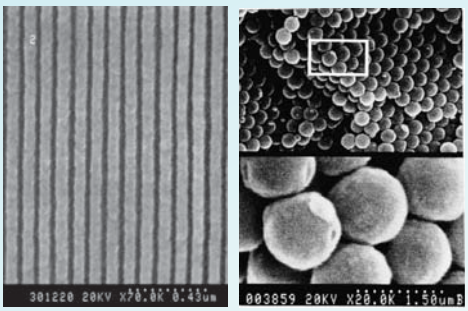
B. I. Stepanov Institute of Physics
National Academy of Sciences of Belarus

Nanophysics and nanotechnologies

Nanophotonic components using photonic crystals and quantum dots

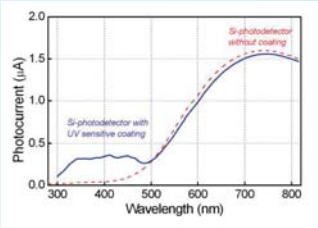
Two- and three-dimensional photonic crystal structure



Applications:

- Novel functional materials for optoelectronics and photonics
- Spectral transformers and antireflecting cover layers for silicon photodetectors and solar cells
- Electro-optical modulators

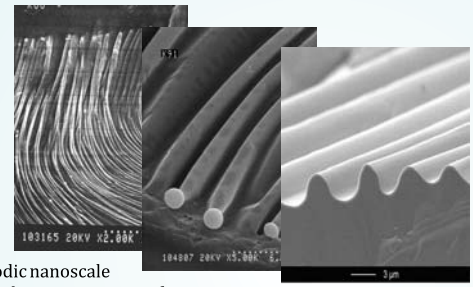
Spectral sensitivity of a silicon detector enhanced by a spectral transformer.



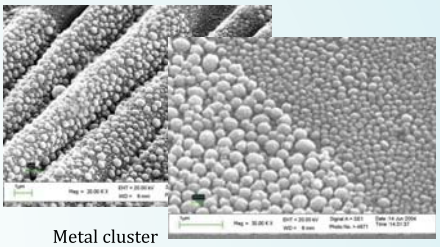
Synthesis of nanostructures

Highly organized nano-scale and submicron surface structures and metal nanostuctured coatings on silicon wafer under the action of plasma flow

Quasi-stationary plasma accelerator



Periodic nanoscale and submicronstructure formations on the surface of silicon wafer, regular bulk structures of 100-1000 nm in diameter and up to 500 microns long were first obtained

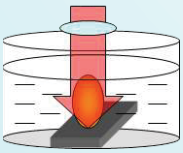


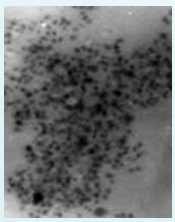
Metal cluster coatings on silicon wafer

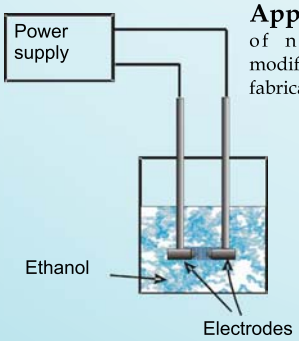
Possible applications: development and creation of a new element base for micro- and opto-electronics.

Laser ablation and electrical discharge techniques in liquids

Nanoparticles of Ag, Au, Cu, Zn, ZnO, Ag-Cu, Ag-Au tungsten and titanium carbides

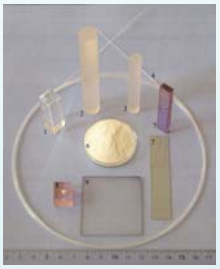






Applications: synthesis of new materials with modified properties, in the fabrication of catalysts etc.

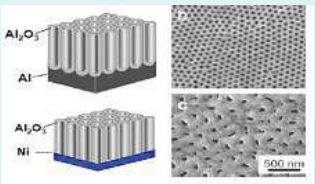
New class of optical materials (glasses, films and ultradispers powder obtained by the sol-gel method) activated with nanoparticles CeO_2:Ln



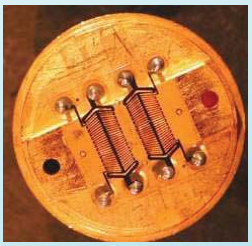
Nanoparticles size: 5...100 nm
Intense absorbtion at $\lambda \leq 400$ nm

Application of the materials: laser media, spectral transformers of the ultra-violet solar radiation to the visible and infra-red regions, optical switchers, and optical media for multiple rewriting of information and luminescent marks

Sensors based on nanoporous alumina



Micro sensor control of concentration of hydrogen, ozone



Applications: Multi sensors systems for bio-nanotechnology, medicine, monitoring of an environment, motor industry, a microrobotics, aviation, rocket and space techniques, etc.

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