State Programme on Nanotechnologies in the Republic of Moldova

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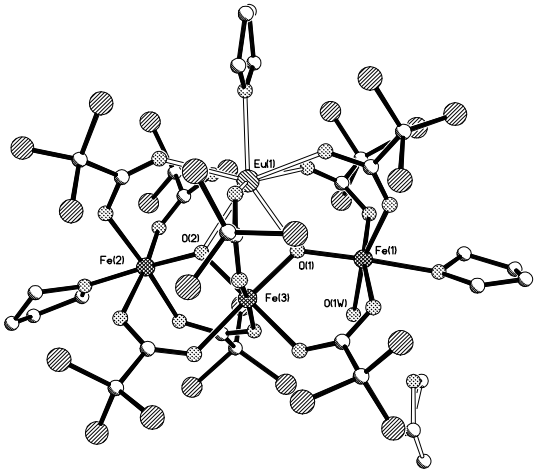
Outline

1. Nanotechnology platform
2. State program on nanotechnologies and nanomaterials
3. Promoting visibility on international scale
4. Education through research
5. Multidisciplinary approach

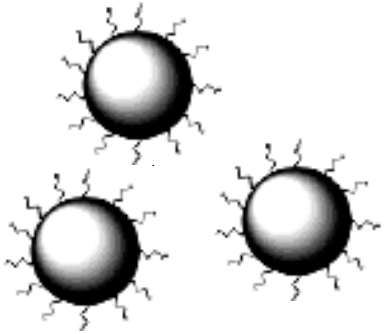
Nanotechnologies in the Republic of Moldova

1. Chemical and electrochemical technologies for growth of coatings, clusters, quantum dots, nanosieves etc.



reflux 200 - 350 C

1, 2 hexadecanediol
RCOOH, RNH_2
solvent



20 nm

2. Technologies for layer deposition, including epitaxy

3. Methods for the fabrication of nanowires, nano-tubes and integrated networks on their basis

State Program on Nanotechnologies and Nanomaterials

1. Inhomogeneous superconductivity in superconductor-ferromagnetic layered nanostructures and elaboration of spin valve

2. Ultra-thin GaN membranes: technology, characterization and development of device structures

3. Networks of amorphous and nanocrystalline microwires for the development of magnetic security tags

4. Thin layers of organic-inorganic nanocomposite materials for the development of new optoelectronic devices

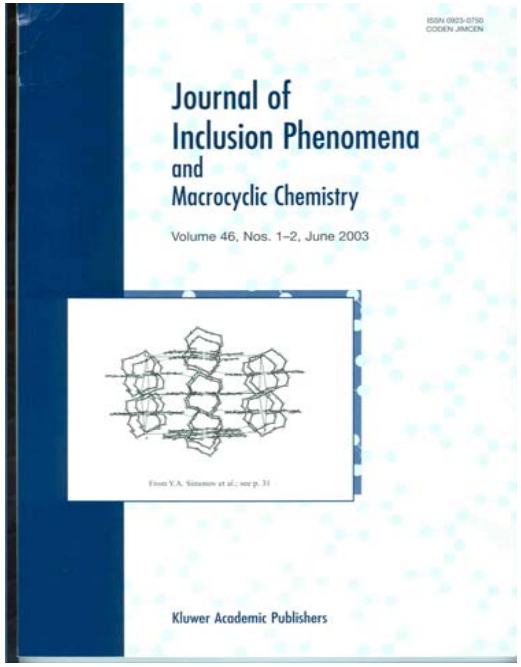
5. Technology for growth of topological insulators for use in spintronics and quantum computers

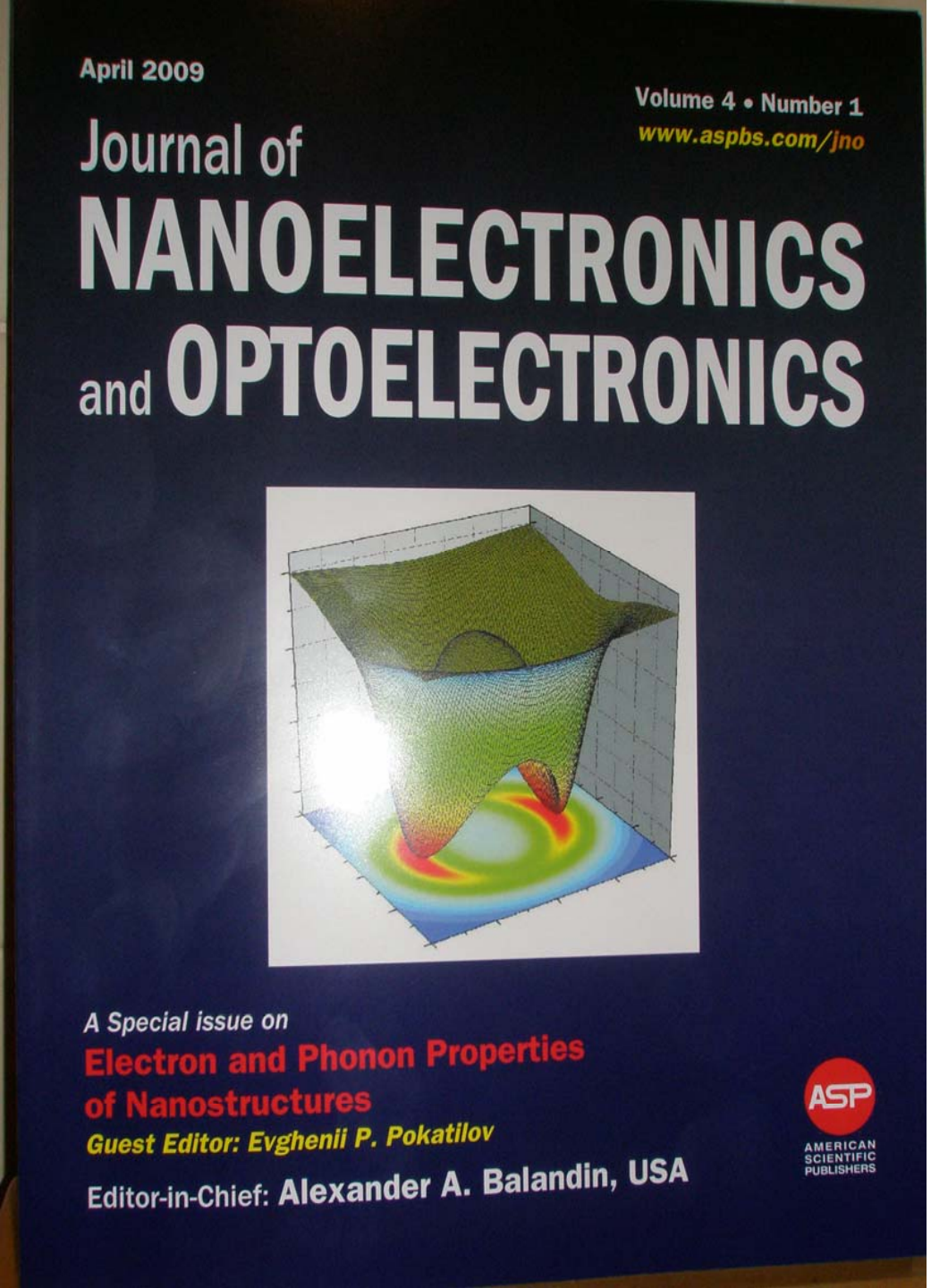
6. Impact of CdSe, ZnSe and ZnS nanoparticles on processes of antioxidant protection of micro-algae and cianoviruses

7. Technologies for growth and nanostructuring of high-conductivity wide-band-gap II-VI semiconductors and alloys (ZnSe-ZnS) for implementation in optoelectronics and photonics

Promoting visibility for nano-research

Results highlighted on journal covers





A new issue of JNO comprising papers from the Republic of Moldova will appear this year

TECHNOLOGY UPDATE

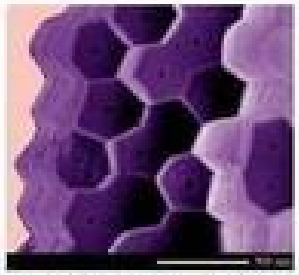
Apr 16, 2010

Temperature orders TiO2 nanotubes

Titanium dioxide nanotubes are widely used in devices to purify air, to make self-cleaning surfaces, in photovoltaics and sensors, and in biomedicine. Now, researchers in Moldova report on a new way to control the inner diameters of the tubes by simply changing the electrolyte temperature during processing. The new result could widen the potential applications for these nanotubular structures even further.

Ion Tiginyanu's team at the Technical University of Moldova and the Academy of Sciences, Moldova, began by anodizing titanium sheets below 0 °C in an electrolyte containing ethylene glycol and hydrofluoric acid. This technique produces self-organized surface nucleation layers with ordered arrays of nanochannels distributed in a 2D hexagonal lattice.

Usually, such electrochemical processes result in random pitting of the surface when applied to semiconductor wafers or metal sheets. Ordering comes later, thanks to interactions between growing pores or tubular structures and the regular structure is effectively "buried" under the overlying disordered nucleation layer.



Titania nanotube structure

Tiginyanu and colleagues discovered that each pore at the surface represents a starting point for the subsequent growth of a double-walled titania nanotube. These individual nanotubes can then be easily detached from the network and studied separately. Indeed, the Moldova team found that individual titania tubes luminescence thanks to a micro-cavity effect, where light follows closed trajectories inside the tubular structures. This is the first time that such an effect has been observed in nanotubes and means that these structures might come in useful for micro-laser applications.

Micro-cavity effect

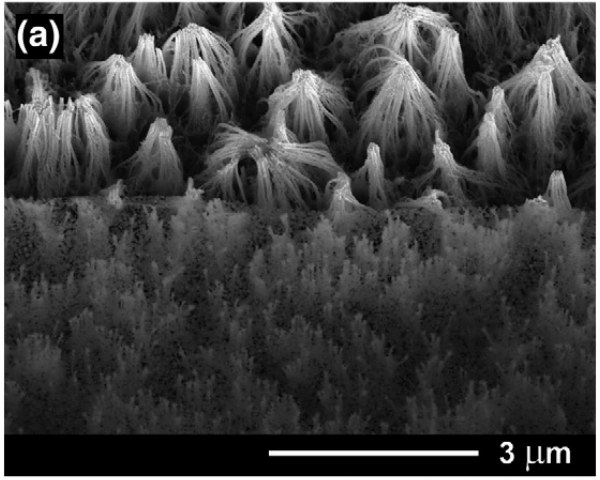
The researchers also found that they could vary the inner diameter of the nanotubes from around 10 nm to more than 250 nm, by increasing the electrolyte temperature. Being able to vary the diameter of nanotubes is important for tailoring their characteristics, explains Tiginyanu.

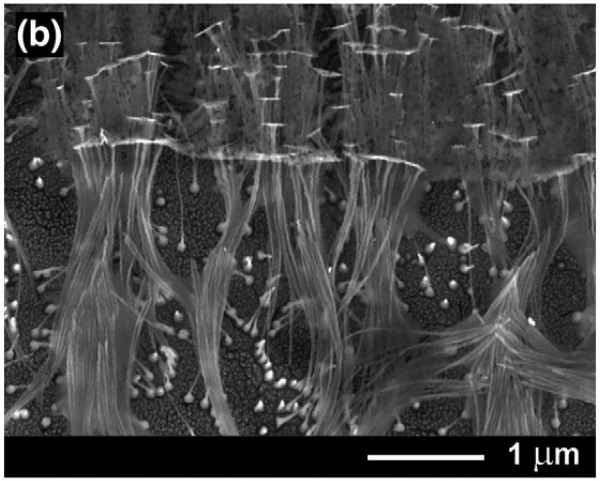
"The new findings are very promising for expanding the applications areas of titania nanotubular structures," he told *nanotechweb.org*. "For example, they might be used to develop cost-effective photonic elements based on negative refractive index materials - in particular flat and concave focusing devices with super-resolution."

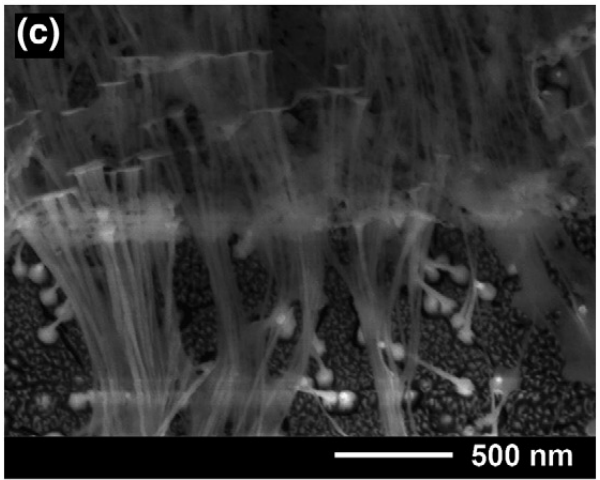
The work was published in *Physica Status Solidi - Rapid Research Letters*.

Membrane-assisted revelation of the spatial nanoarchitecture of dislocation networks

1-nm thick membrane







Materials Letters 65, 360–362 (2011)

Education through research

Scientific educational Cluster
of the Academy of Sciences of Moldova

„UniVER SCIENCE”

Education through RESEARCH

Nucleus of the CLUSTER

- Lyceum for gifted children;
- University of ASM;
- Research institutions;
- Science and Technology Parks;
- Innovative incubator.

The Cluster promotes multidisciplinary education

MOLD-ERA FP7 Project
2010-2013
500,000 Euro

Master courses
Summer schools
in Nano-Bio-Engineering

Thank you

for your kind attention!