



# State Programme on Nanotechnologies in the Republic of Moldova

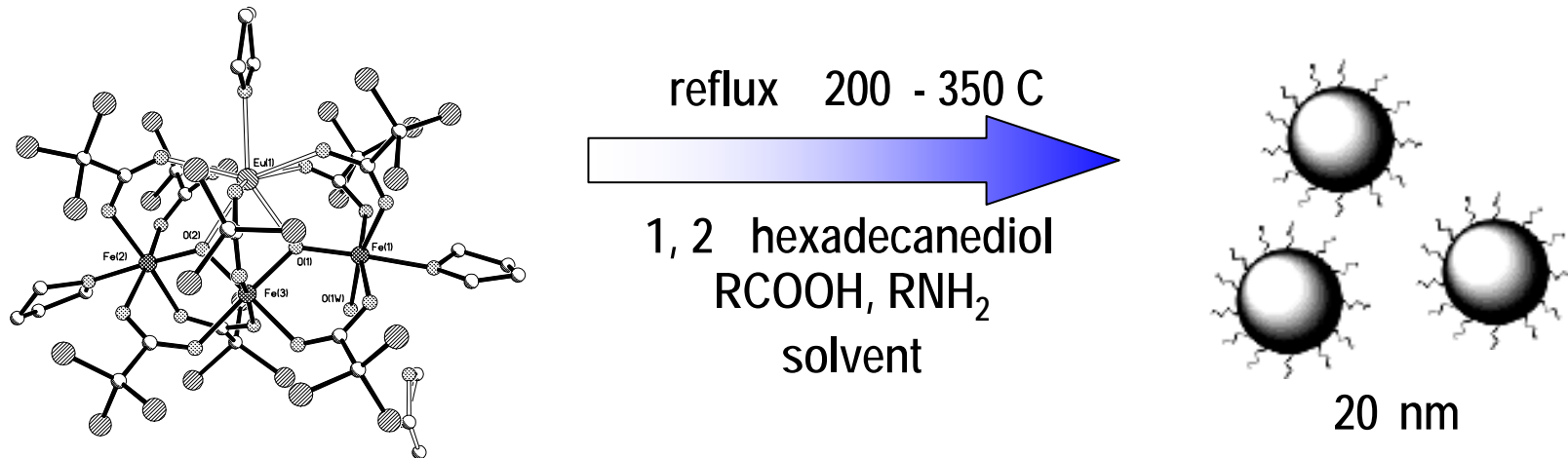
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# Outline

- 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.



## 2. Technologies for layer deposition, including epitaxy

### 3. Methods for the fabrication of nanowires, nanotubes 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 cyanoviruses**
- 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**

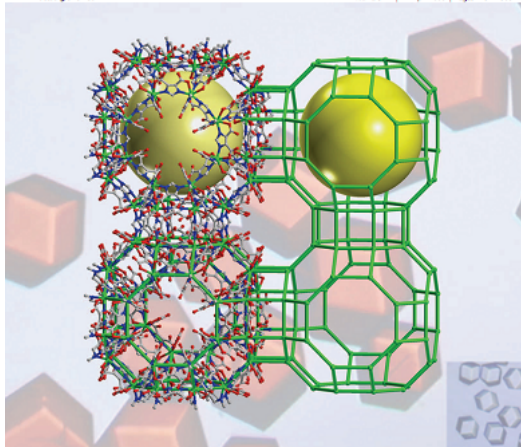
# **Promoting visibility for nano-research**

# ChemComm

Chemical Communications

www.rsc.org/chemcomm

Number 14 | 14 April 2008 | Pages 1457–1508



ISSN 1463-9069

RSC Publishing

**COMMUNICATION**  
Yunling Li, Victor Chevalier, Randy Lerner and Robert E. Cohen  
Rapid synthesis of a new class of  
polymeric materials with  
nanoscale structure and  
properties

**FEATURE ARTICLE**  
Richard A. J. Orr  
The 20th anniversary of the  
discovery of the first  
nanoscale structure and  
properties



1463-9069(200814)14:1-0

## Journal of Inclusion Phenomena and Macrocyclic Chemistry

Volume 46, Nos. 1–2, June 2003



From V.A. Sirota et al., see p. 31

Kluwer Academic Publishers

ISSN 0933-0710  
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Results highlighted  
on journal covers

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rapid research letters



Focus on  
negative materials

Prediction of negative index material lenses  
based on metallo-dielectric nanotubes  
(V. V. Sergent, I. M. Tiginyanu, V. V. Ursaki,  
M. Enachi, S. R. Abu, and P. Schumik, p. 242)

2 • 5 • October 2008

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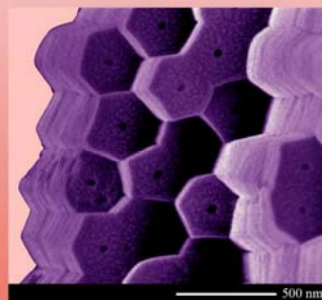
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First Impact Factor 2008  
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Ordered arrays of double-walled TiO<sub>2</sub> nanotubes  
with temperature controlled inner diameter  
(Mihai Enachi, Ion Tiginyanu, Veaceslav Sprincean,  
and Veaceslav Ursaki, p. 100)

4 • 5 • 6 • June 2010

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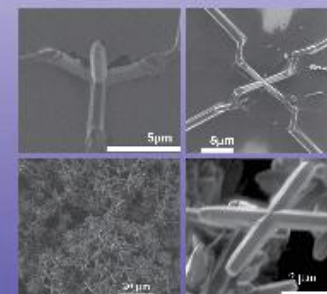
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basic solid state physics

First Impact Factor 2008  
1.17



High resolution of 2D/2D nanotubes and nanowires  
(Mihai Enachi, Ion Tiginyanu, Veaceslav Sprincean,  
and Veaceslav Ursaki, p. 100)

247 • 7 • July 2010

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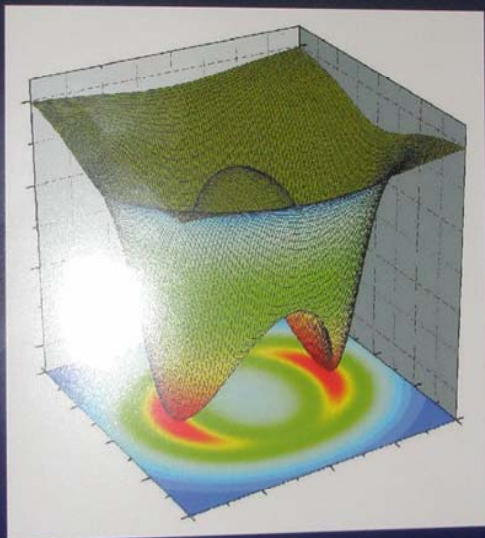
With contributions from the  
2009 E-MRS Fall Meeting  
Symposium 6



April 2009

Volume 4 • Number 1  
[www.aspbs.com/jno](http://www.aspbs.com/jno)

# Journal of **NANOELECTRONICS** and **OPTOELECTRONICS**



*A Special issue on*

**Electron and Phonon Properties  
of Nanostructures**

**Guest Editor: Evghenii P. Pokatilov**

**Editor-in-Chief: Alexander A. Balandin, USA**



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comprising papers  
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Moldova will appear  
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## TECHNOLOGY UPDATE

Apr 16, 2010

**Temperature orders TiO<sub>2</sub> 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.



Titanium 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.



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."

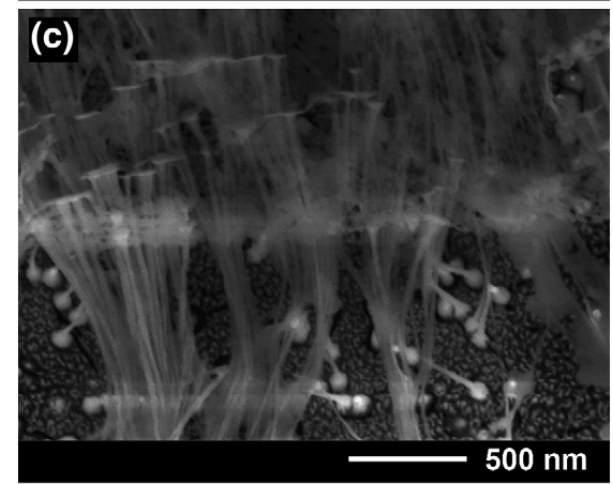
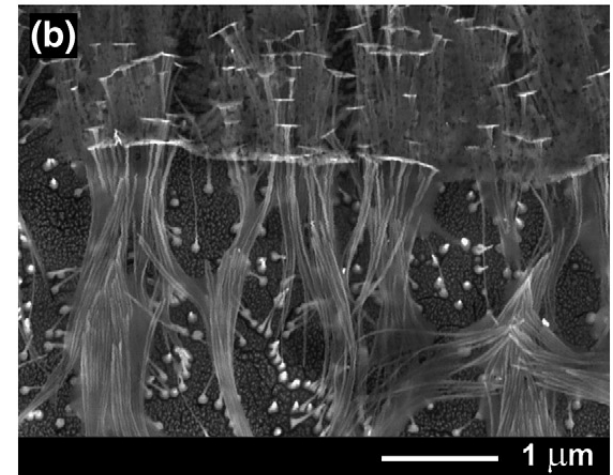
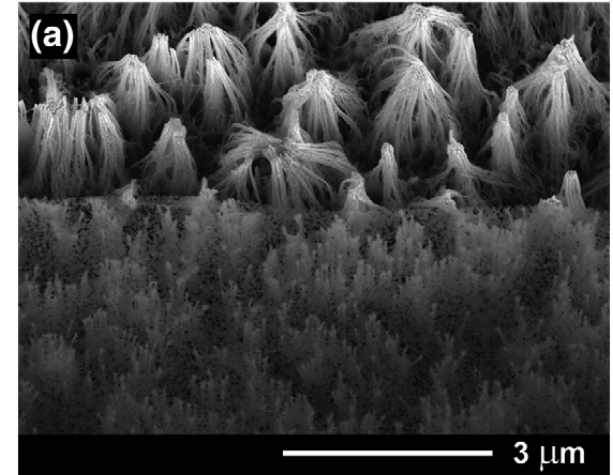
The work was published in *Physica Status Solidi - Rapid Research Letters*.



# 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 „Unīver SCIENCE”



*Education through RESEARCH*



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- ❖ **University of ASM;**
- ❖ **Research institutions;**
- ❖ **Science and Technology Parks;**
- ❖ **Innovative incubator.**

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multidisciplinary education**

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