



SUNGREEN  
UNIVERSITY OF NOVA GORICA

**SUNGREEN – Strengthening University of Nova Gorica  
Research Potential in Environmental Sciences and Novel Nanomaterials**

# **The SUNGREEN project – Strengthening University of Nova Gorica Research Potential in Environmental Sciences and Novel Nanomaterials**

**European Grant, 7FP RegPot, 2011-2015**

**Keywords:** Environmental Sciences, Nanomaterials, Research Potential

The SUNGREEN project seeks to reinforce the University of Nova Gorica, strengthening its innovative approach to research and development of new knowledge in environmental science and novel nano-structured materials. The reinforcement will be realized through establishment of strategic partnerships with European research and development centres, recruitment of experienced researchers, acquisition of state-of-the-art research infrastructure, enhancement of the University of Nova Gorica visibility and its collaboration with different stakeholders in the region.

The University of Nova Gorica prides itself on its excellent environmental science reputation, the result of an integration of a number of disciplines: physics, chemistry, biology, material sciences and computational sciences. The main objective of the project is to strengthen the University's research potential, its knowledge and research equipment. The project will enhance the capacity of the University of Nova Gorica to successfully participate in research activities at the European Union level.

The project will provide paths for an industrial uptake of new environmental technologies and will contribute to knowledge based economy as well as to a cleaner environment. A know-how transfer will enable industries in the region to produce innovative new products with a strong added value. By implementing the project, the University of Nova Gorica will establish partnerships that will enable an economically sustainable research both at university level and in collaboration with the network of partnering organisations.

Key **SUNGREEN**-project work packages:

- 2.** Exchange of know-how – the integration of the University of Nova Gorica in the European Research Area. The researchers will be able to visit most prestigious laboratories at the European research institutions in the field of environmental sciences and nanomaterials, and to host researchers from these research institutions to share know-how and plan common research activities;
- 3.** Recruitment of experienced researchers in the fields of synthesis of nanomaterials, structural characterisation and spectroscopy applied to nanomaterials for environment and energy;
- 4.** Upgrading of research equipment – scanning and transmission electron microscopes (SEM, TEM);
- 5.** Networking for innovation – establishing links with regional socioeconomic environment and industry, European Union institutions, national and local government, different agencies, networks and the industrial sector;
- 6.** Organisation of conferences and workshops in the field of environmental sciences and nanomaterials, and participation at international conferences and workshops so as to increase the scientific collaboration of the University of Nova Gorica with European researchers.

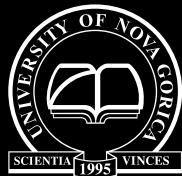
Project coordinator: Matjaž Valant.

Assistant project coordinator: Sandra Gardonio.

Research project manager: Aljaž Rener.

**Contact:**

Matjaž Valant (SUNGREEN project coordinator)  
Univerza v Novi Gorici, Vipavska 11c, 5270 Ajdovščina, Slovenija  
M matjaz.valant@ung.si  
T +386 5 365 3502  
F +386 5 365 3527  
W <http://sungreen.ung.si>



## The University of Nova Gorica

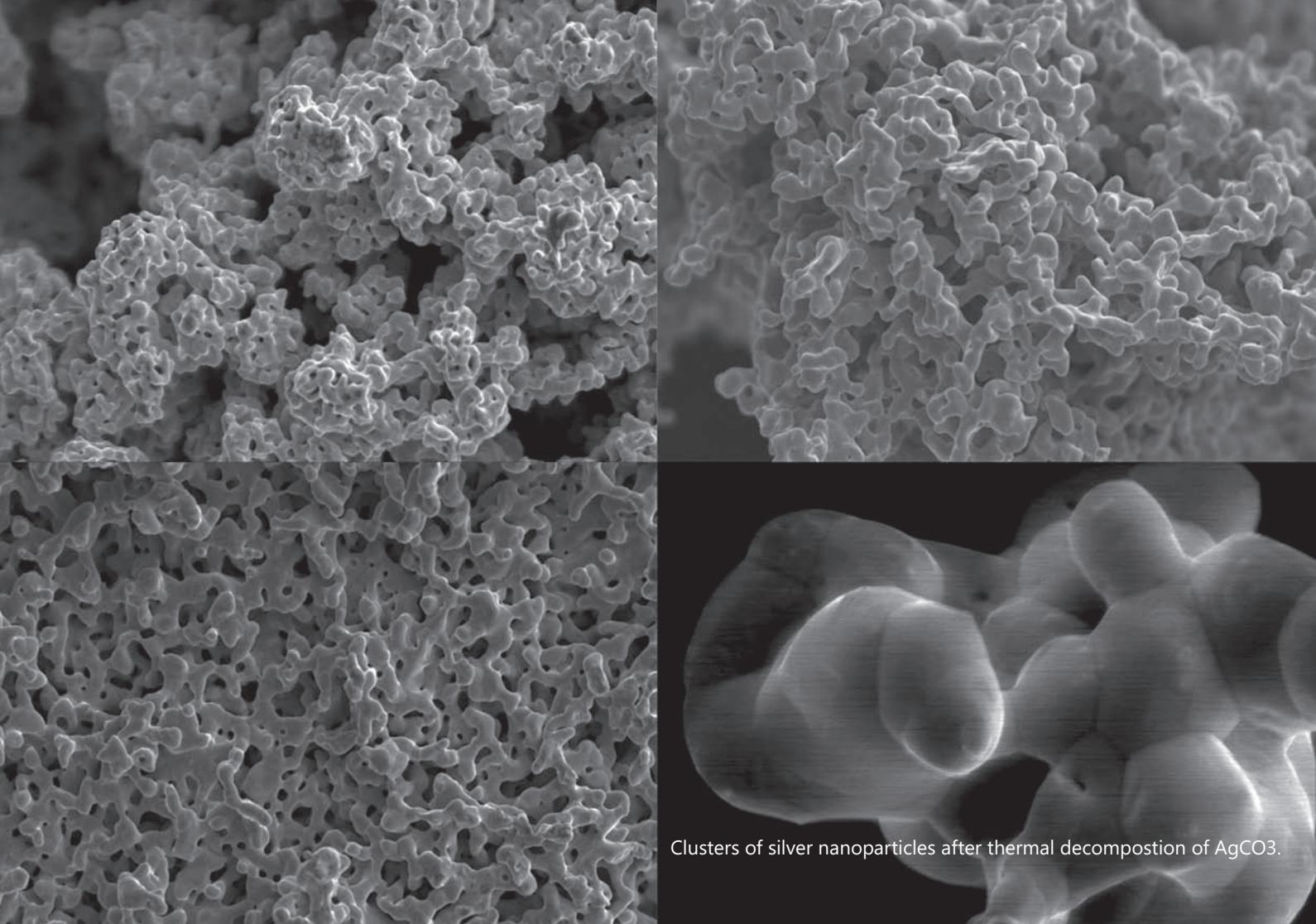
The University of Nova Gorica, Slovenia, is the beneficiary of the SUNGREEN European Grant.

<http://www.ung.si>

The University of Nova Gorica is a higher education institution offering undergraduate and graduate study programmes and conducting scientific research. At present the University offers its programmes at seven schools while research is conducted at six laboratories and five centres.

The University of Nova Gorica research departments are part of a flexible organisational structure and are only formally divided into specific units. Research equipment is shared between departments and research work is often performed by interdisciplinary groups composed of research fellows from different departments.

**Centre for Biomedical Sciences and Engineering, Centre for Atmospheric Research,  
Centre for Systems and Information Technologies, Laboratory for Astroparticle Physics,  
Laboratory for Environmental Research, Laboratory for Multiphase Processes, Laboratory of  
Organic Matter Physics, Laboratory of Quantum Optics, Materials Research Laboratory,  
Research Centre for Humanities, Wine Research Centre.**



Clusters of silver nanoparticles after thermal decompostion of AgCO<sub>3</sub>.

## Partnering organisations



**Delft University of Technology** is the largest and most comprehensive university of engineering sciences in The Netherlands. Active at the forefront of technological development, it contributes to scientific advancement in the interests of society by developing technologies for future generations with an emphasis on sustainability, safety and economic vitality.  
<http://tudelft.nl>



**École polytechnique fédérale de Lausanne**. With more than 300 laboratories and research groups on campus, EPFL is one of the Europe's most innovative and productive technology institutes. At EPFL, the emphasis is on both theoretical and applied research.  
<http://epfl.ch>



**Imperial College London**

**Elettra - Sincrotrone Trieste** is an international multidisciplinary laboratory specialized in synchrotron radiation and its use in the science of matter. It is located in Basovizza on the outskirts of Trieste and is operated by Elettra – Sincrotrone Trieste S.C.p.A. as a user facility. The laboratory features a 2.4 GeV, third-generation synchrotron radiation source, also named Elettra, and a fourth-generation light source based on a free-electron laser, FERMI@Elettra.  
<http://www.elettra.trieste.it>

**Imperial College London** is one of the world's most prestigious university colleges.

Imperial's research and teaching are organised within a network of faculties and academic departments. The Imperial College London entity to be involved in the project is Department of Materials along with the Imperial section of London Centre for Nanotechnology. The Department of Materials is one of the world's leading research entities in the field; its success is based on the outstanding academic and research staff achievements.

<http://imperial.ac.uk>

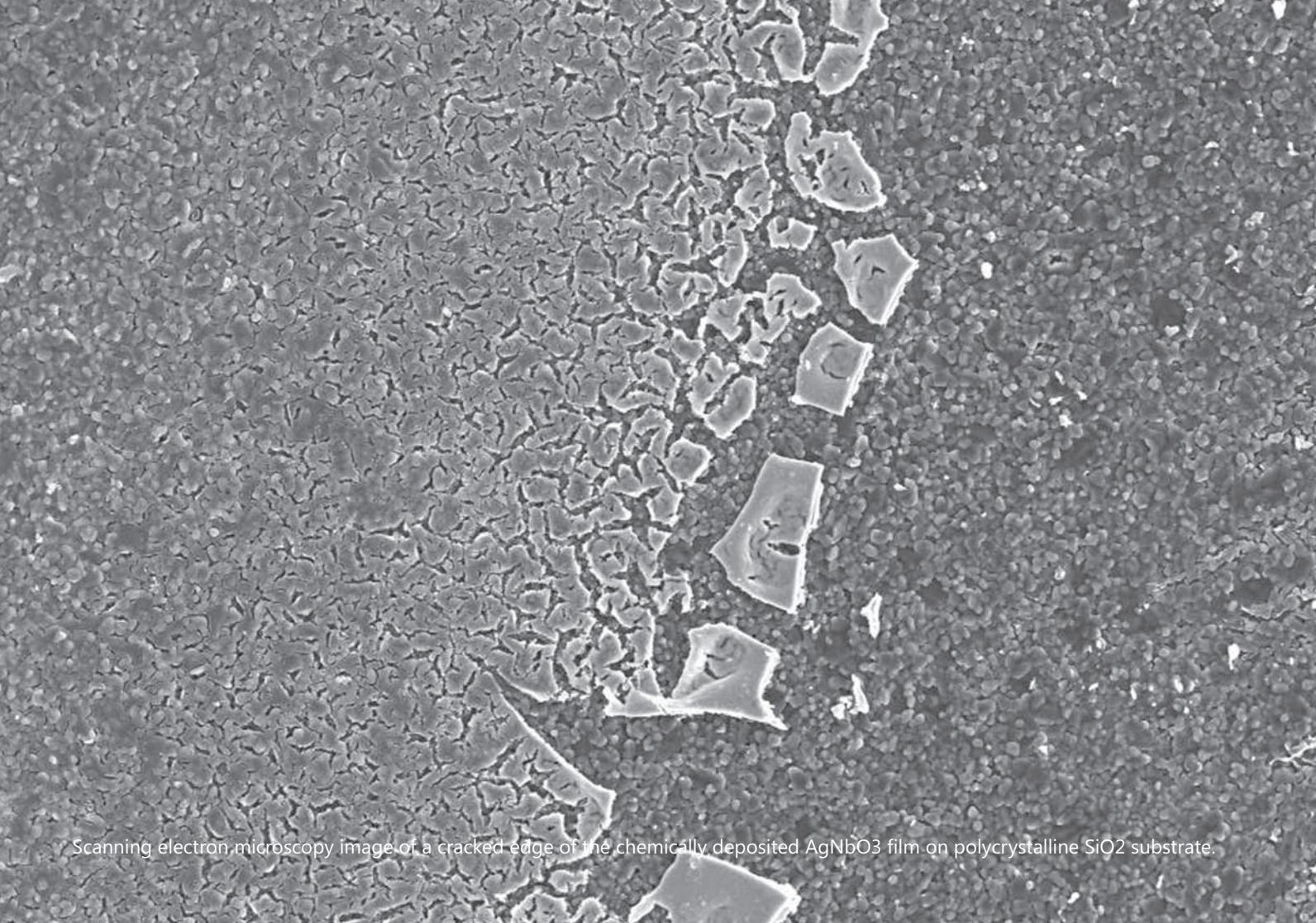
## **Scanning and transmission electron microscopes (SEM, TEM) at the University of Nova Gorica**

Equipment to be purchased:

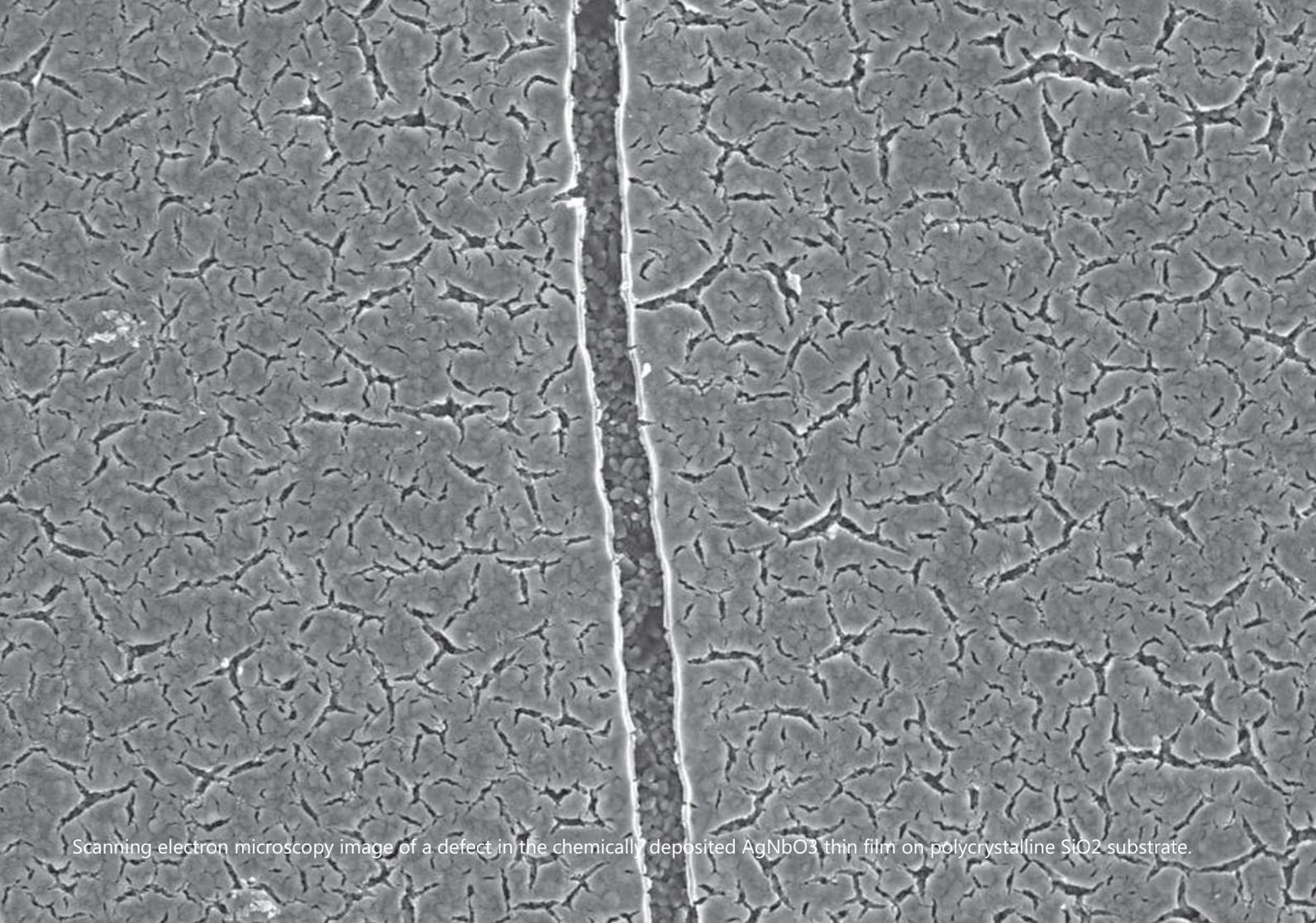
- field emission SEM with cathodoluminescence,
- 200 kV field emission TEM with scanning mode,
- full sample preparation kit.

SEM and TEM are essential for an enhancement of research capacity at all of the University of Nova Gorica research departments in the field of environmental sciences – the study of the microstructure, morphology, phase composition, elemental composition, compositional gradient, interfaces, crystallographic characteristics, defect structures, grain boundary conditions, domain structures, strain, nano-particle characteristics, thin film structure, reactive layers and other materials features.

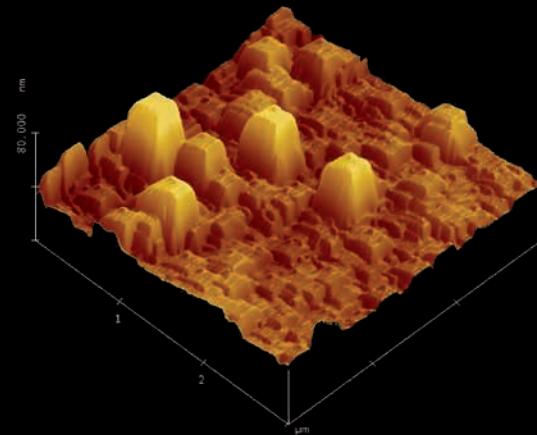
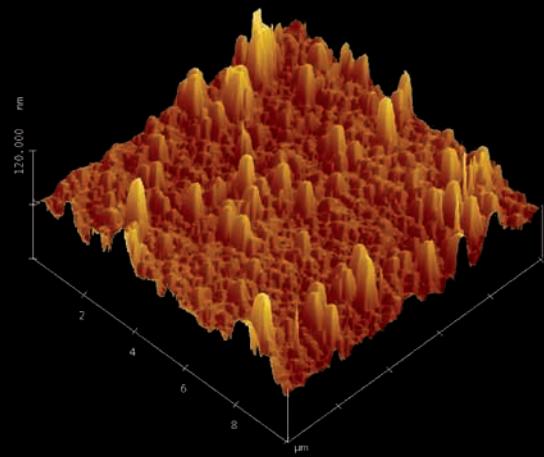
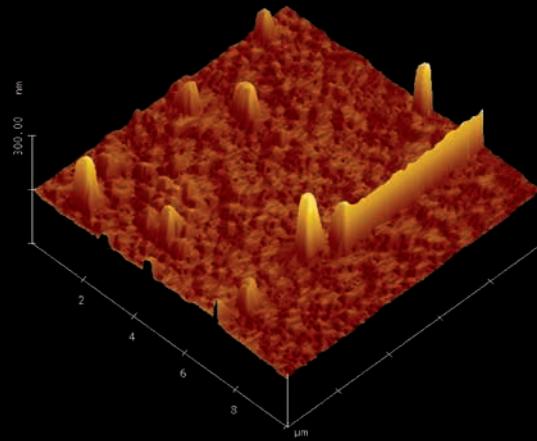
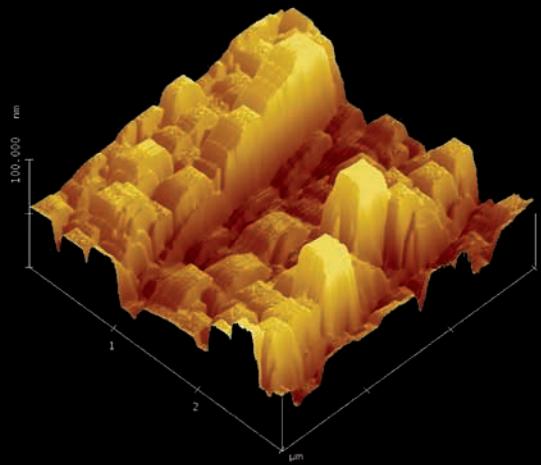
Our researchers deal with materials whose functional properties such as opto-electronic, photo-catalytic, electrical, magnetic and mechanic properties are essentially influenced by the crystal structure, defects, phase inclusions, structural distortion, etc. Often these materials' features are sensitive to applied conditions (pressure, temperature, precursors etc.) during the synthesis, deposition of films, sintering or any other process related to thermal treatment. All this becomes even more important for nano-structured materials that are most commonly used in studies of photo-catalysts, functional thin films, conjugated polymers for organic solar cells or solar splitting of water for hydrogen production.



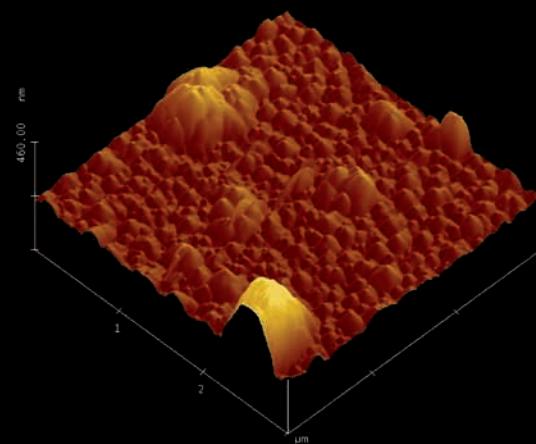
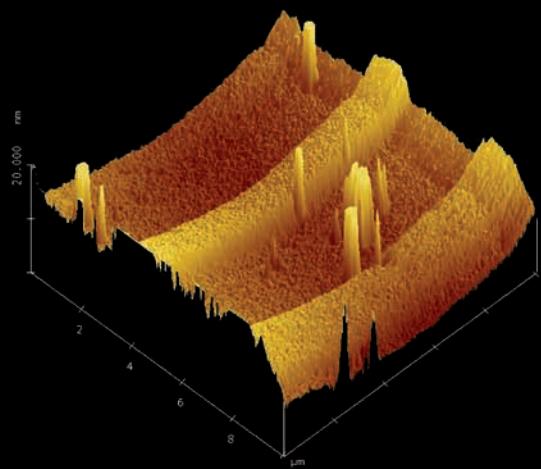
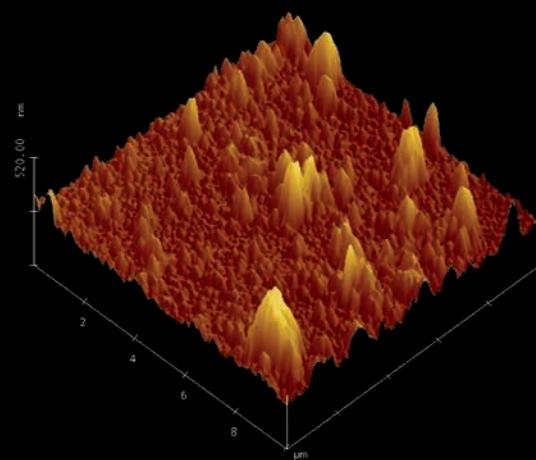
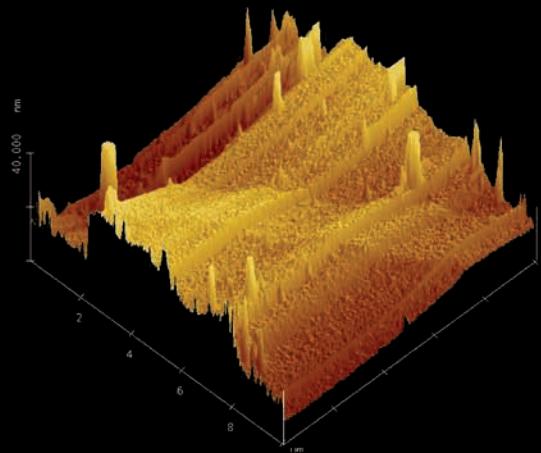
Scanning electron microscopy image of a cracked edge of the chemically deposited  $\text{AgNbO}_3$  film on polycrystalline  $\text{SiO}_2$  substrate.



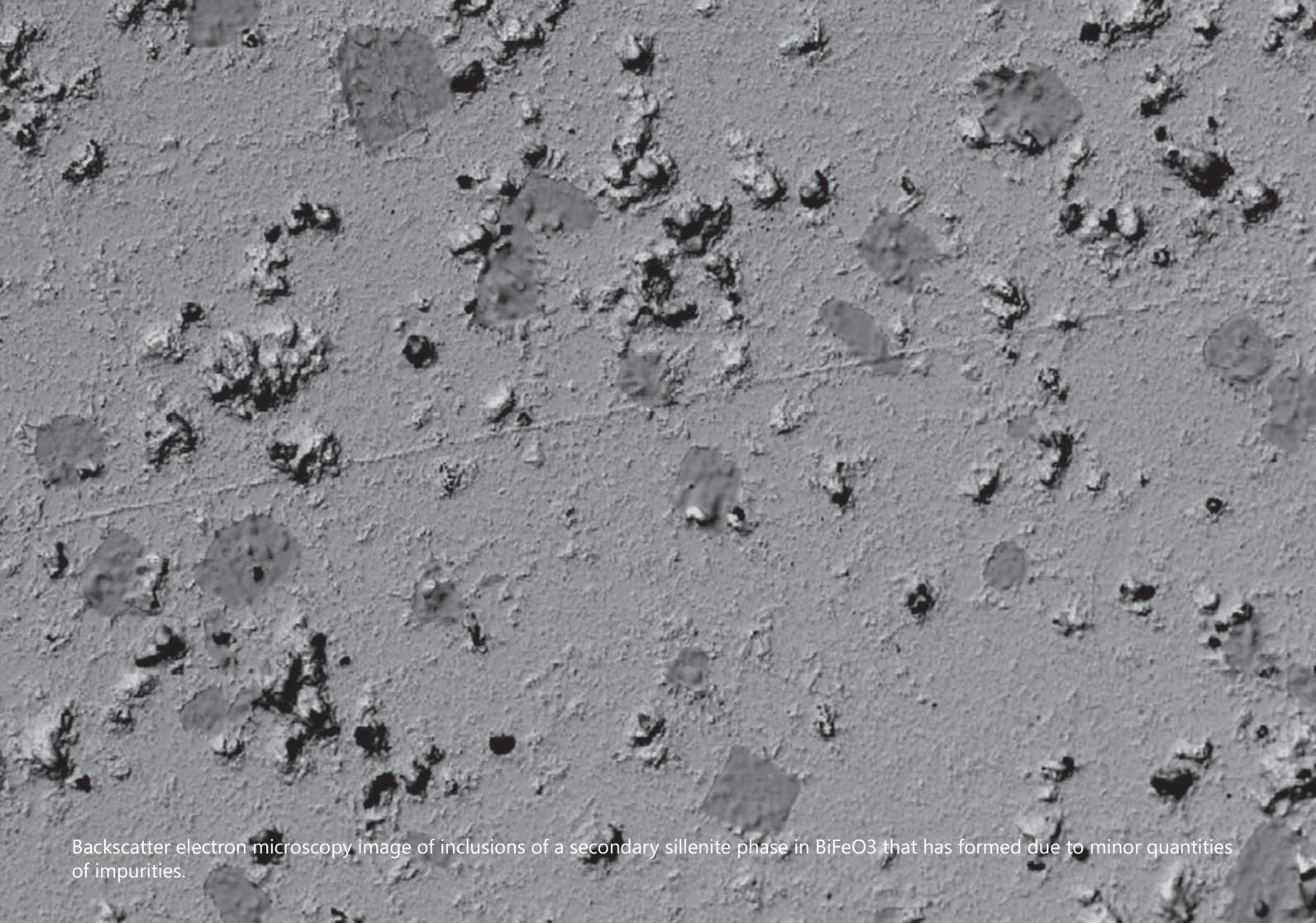
Scanning electron microscopy image of a defect in the chemically deposited AgNbO<sub>3</sub> thin film on polycrystalline SiO<sub>2</sub> substrate.



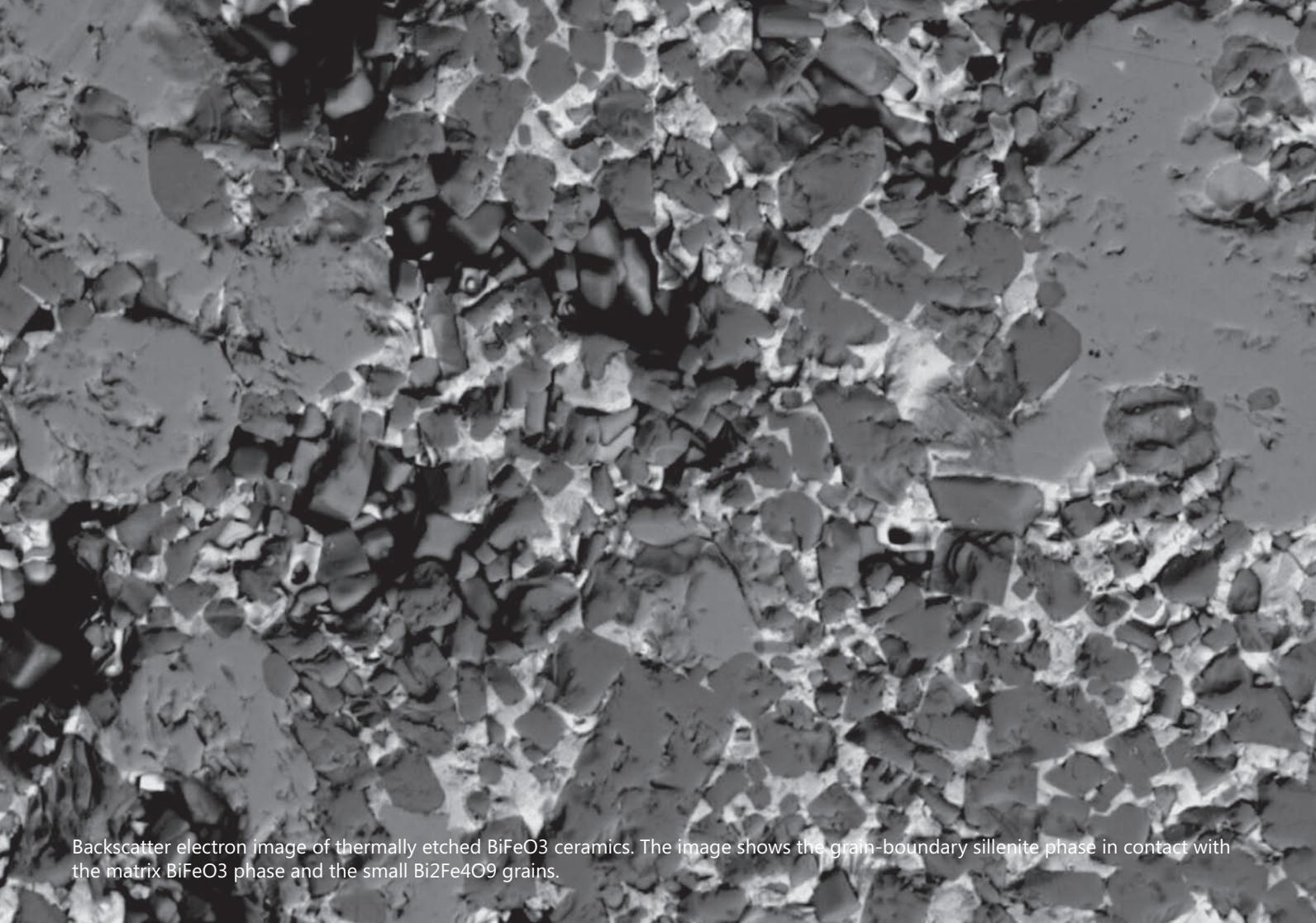
Atomic Force microscopy image of morphology of epitaxial AgNbO<sub>3</sub> thin films produced by pulsed laser deposition. The roughness of the surface depends on deposition conditions such as laser pulse rate, substrate temperature or pressure in the chamber.



Atomic force microscopy image of morphology of epitaxial AgNbO<sub>3</sub> films deposited on MgO substrate. The films reflect the crystallographic defect features of underlaying substrate.



Backscatter electron microscopy image of inclusions of a secondary sillenite phase in  $\text{BiFeO}_3$  that has formed due to minor quantities of impurities.



Backscatter electron image of thermally etched BiFeO<sub>3</sub> ceramics. The image shows the grain-boundary sillenite phase in contact with the matrix BiFeO<sub>3</sub> phase and the small Bi<sub>2</sub>Fe<sub>4</sub>O<sub>9</sub> grains.

## **Recruitment of experienced researchers**

The experienced researchers will be recruited and employed to increase knowledge in research themes related to environmental sciences and novel nanomaterials. The experts from the following research fields will be recruited in order to realise full research potential of the University of Nova Gorica: **SEM Microscopy, TEM Microscopy, Physics of materials, Synthesis of oxide and metallic nanostructures, Data mining, Interface of nano-structured materials and biological active molecules, Experimental solid state physics, Ab initio calculations and modelling, Pump-probe spectroscopy, Photo(electro)chemical and photo-catalytic engineering, Research project manager, Industrial liaison expert.**

## **Networking for innovation**

The objective of this work package is to enhance the efforts of the University of Nova Gorica in establishing links with the socioeconomic environment and industry in the region, with the institutions of the European Union, National and local government, different agencies, networks and the collective organisations of the industrial sector and creating conditions for the development of knowledge based clusters.

Enhancement of the capability of the University for the technological transfer of its know-how in the field of environmental science and novel nano-materials is the goal of the work package five. The tasks will include the establishment of the industrial liaison office and the formulation of intellectual property rights management strategy of the University of Nova Gorica. Networking efforts will span European industry, and small and medium enterprises, by establishing links with Slovenian and European technology platforms and industry associations, and by focusing on the neighbouring northern-eastern Italian region in particular.

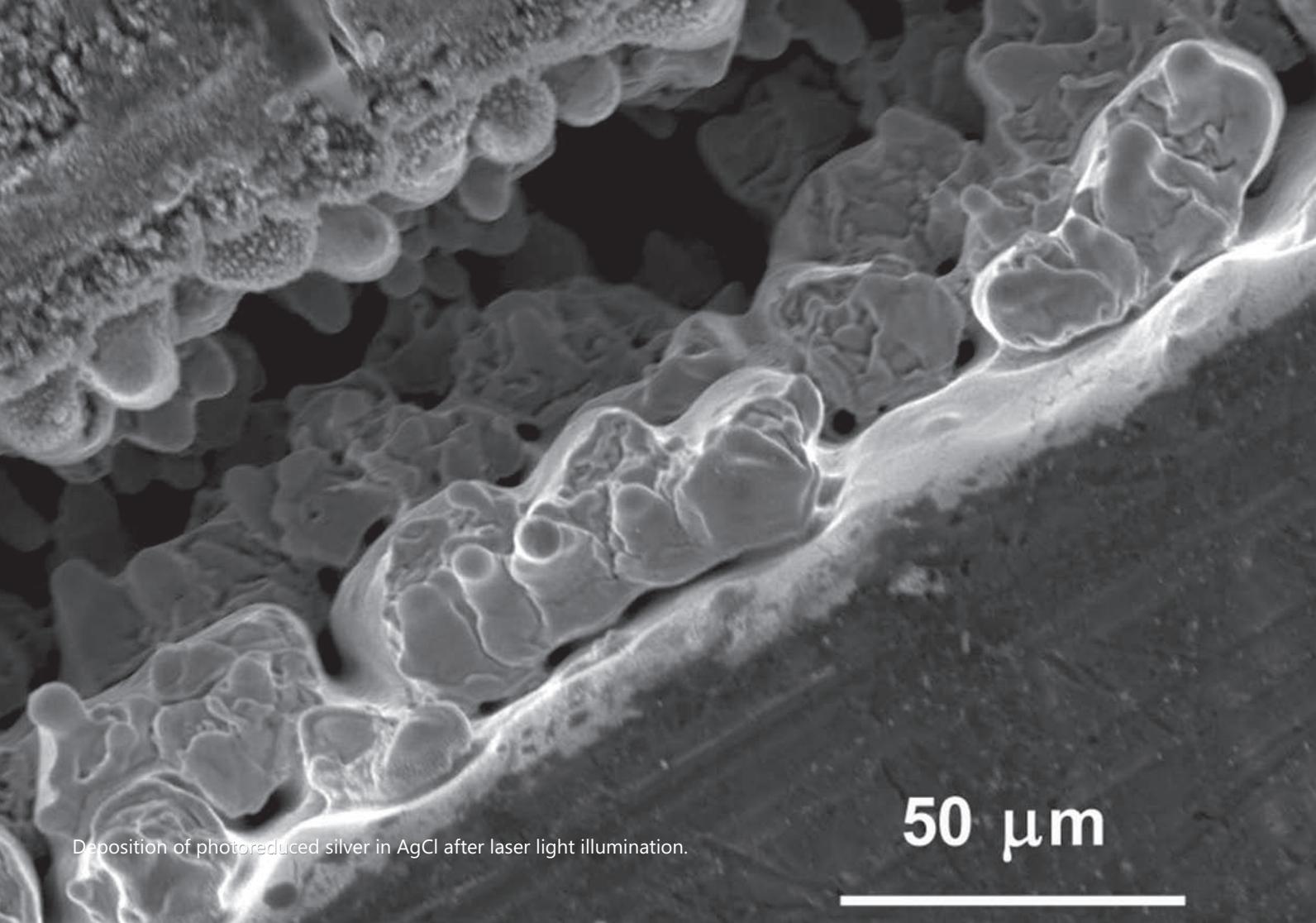
## **Organisation of international conferences and workshops on topics related to the field of environmental sciences and novel nanomaterials**

Conferences:

- **Conference Time and Matter 2013** (Venice, Italy, 4-8 March 2013);
- **European Conference of Materials and Technologies for Sustainable Growth – Eco-MaTech 2013** (co-organizers: Technical University Delft, Elettra - Sincrotrone Trieste, Helmholtz Zentrum Berlin, École Polytechnique Fédérale de Lausanne, Bled, 19-21 September 2013);
- **3rd European Symposium on Photocatalysis – JEP 2013** (co-organizer: European Photocatalysis Federation, Portorož, 25-27 September 2013);
- **International Symposium on Solid Liquid Phase Change Problems** (Vipava, September 2013).

Thematic workshops:

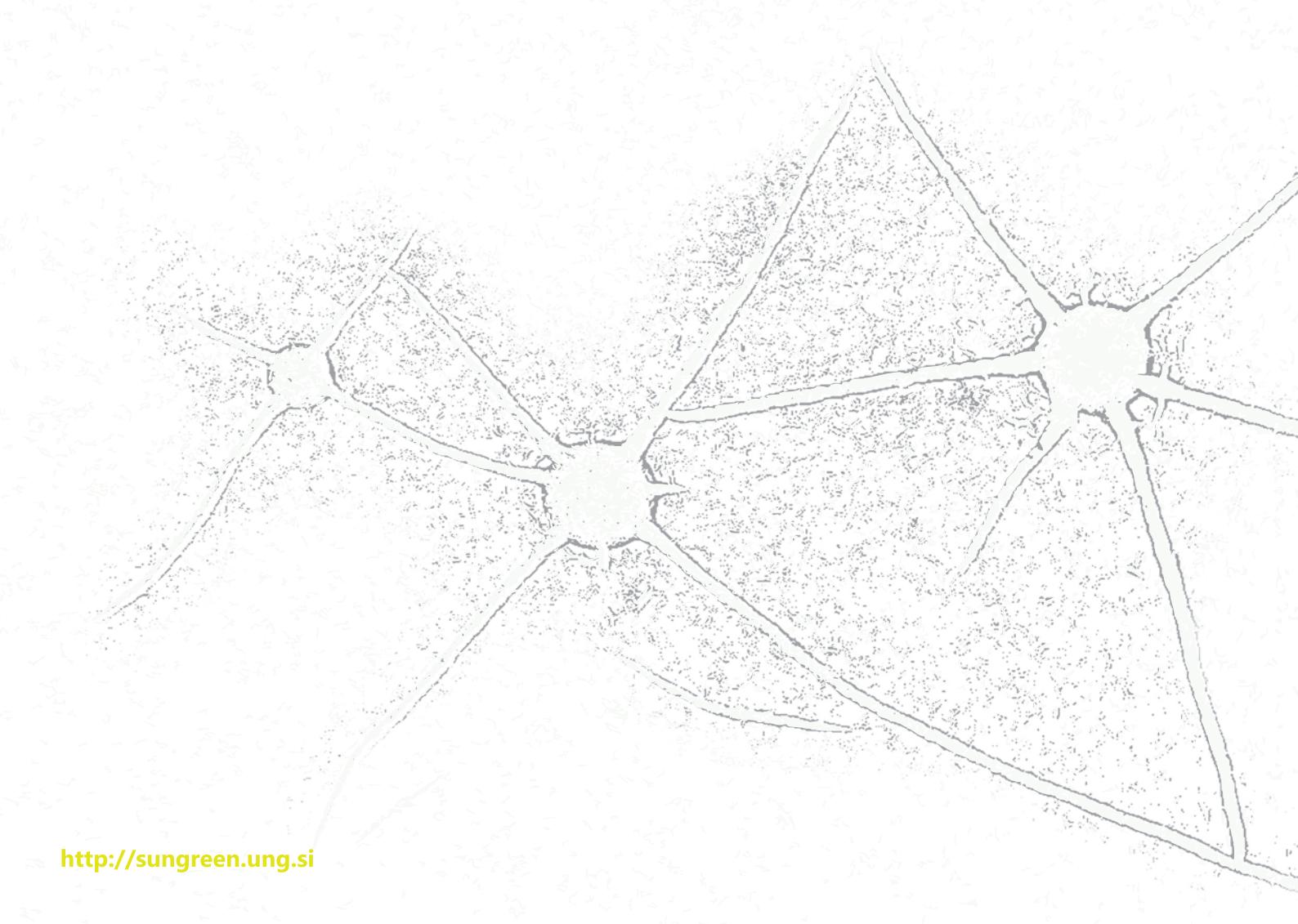
- **Instrumental Analytical Methods for Environmental Monitoring** (Nova Gorica, 22-23 June 2012);
- **Materials for Renewable Energy Production** (Ajdovščina, 8-11 April 2013);
- **Toxicology Related Topics** (Portorož, 14-15 June 2013);
- **Clean and Sustainable Technologies** (Portorož, 24-25 September 2013).



Deposition of photoreduced silver in AgCl after laser light illumination.

50  $\mu$ m





<http://sungreen.ung.si>