

PRESS RELEASE

Nanotechnology: From Materials to Science

Research in high-energy physics has allowed for the development of accelerator and detector technology that can be applied in other research fields, and nanotechnology is very attractive for synergies. On the other hand, conventional techniques and methods for characterisation and analysis of the nanostructures have reached their limit, therefore further development is an essential precondition for the success of nanotechnology research.



Aiming to bring companies and researchers active in the field of nanostructures and nanoanalytics together with experts from other research fields, like high-energy physics or medical science, HEPTech and the ACCELERATE EU project organized an academia-industry matching event held on 15-16 February 2018, at Charles University in Prague. About 60 participants from 11 European countries discussed and explored synergies fostering knowledge transfer and

collaboration for the development of further innovative technologies and applications in the field of nanotechnology.

This forum was part of the HEPTech's programme in nanotechnology, and was run in conjunction with the ACCELERATE project, funded by the EU's Horizon 2020 research and innovation programme under grant agreement N. 731112.

Ian Tracey, HEPTech's Secretary General, opened the event emphasizing that it would provide an opportunity for the representatives of academia and industry to explore the topic together.



In the first day, the CERIC-ERIC research infrastructure specialized in materials, biomaterials and nanotechnology presented the ACCELERATE project, which aims to support the long-term sustainability of large-scale research infrastructures such as CERIC-ERIC. The National Institute of



Materials Physics in Magurele, Romania, introduced its new Research Innovation and Technology Centre for New Materials highlighting the availability of both characterization and fabrication equipment. In terms of characterization of doped wide-bandgap semiconductors, the Institute revealed some results of its electron paramagnetic resonance (EPR) spectroscopy investigations on nanostructured semiconductors doped with transition metal ions. The Institute also

presented various examples of studies using high resolution transmission electron microscopy (HRTEM) for characterisation of thin films and nanostructural materials and illustrated the practical potential of the advanced microstructural investigations for future collaborations with industrial partners.

The Czech company NenoVision, specialised in the development and integration of different techniques into compact instrumentation, revealed how the integration of its LiteScopeSPM (scanning probe microscopy) into the SEM (scanning electron microscopy) extends the instrument capabilities and offers several benefits like 3D characterization, measurements of electrical and magnetic properties and others. The company also introduced its new unique measurement technique for correlative imaging - the Correlative Probe and Electron Microscopy (CPEM), which enables direct comparison of images from SEM and SPM.



NenoVision was established in 2015 as a spin-off of the Brno University of Technology and the Central European Institute of Technology (CEITEC) in the Czech Republic. This company of

6 people is keen on the academia-industry matching events since they have proven helpful in increasing its visibility. „At such events we can introduce our product and approach to measurements, make contacts, step into the market and finally, increase the sales”, says Jan Neuman Ph.D., a founder and CEO of NenoVision. „My goal is to send a message to companies and research institutions that we offer such solutions, to check if our technology fits to their needs or we have to modify it”, concludes Neuman.

NenoVision is a good example of cooperation demonstrated at the event. In the development of correlative microscopy the company collaborates with TESKAN, a well-established in the market

provider of innovative electron and light microscopy systems designed specifically to address the needs of material science, life sciences and semiconductor industry. Rodrigo Blando, technical writer¹ at TESKAN, says that such events help him map the various applications currently available in the field of nanomaterials.

„As a technical writer my task is to get to know the current needs of the different labs both in academia and private sector, so that TESKAN can help them achieve their goals”, elaborates Blando.



A presentation from Helmholtz Center Geesthacht outlined the latest developments in a multitude of X-ray imaging techniques, specifically adapted to the demand of materials science related research, such as X-ray Microtomography, X-ray Nanotomography and Scanning X-ray Nano diffraction. Using these techniques at the world’s largest synchrotron radiation source PETRA III in Hamburg, Germany, the researchers can visualize 3D microscopic structures with “invisible” structures such as maps of residual stress profiles, all with resolutions down to below 1 μm .

A talk from the National Research Council of Italy discussed best practices and challenges in usage of nanoparticle drugs. The audience was challenged by the question if a drug (nanoparticle) could be created to target the brain.

On the second day of the event, the Czech Academy of Sciences revealed results of experiments concerning morphology-performance dependence in electrode materials.

Representatives of Elettra Sincrotrone Trieste focused on the capabilities of their beamline XAFS

for *operando* characterization of advanced batteries and fuel cells using x-ray absorption spectroscopy and on the X-ray Photoelectron Spectroscopy (XPS) from a micro-spot, where the X-ray beam can be downsized to a diameter of 120 nm, allowing for an imaging resolution of less than 50 nm. The XPS techniques are applied to study electrochemical systems and semiconductors’ behavior under nanoscale in operating conditions. They also presented their RENEWALS project aiming to set up reproducible and easy methods for graphene liquid cell production that go beyond the proof-of-principle experiments and focus on biocompatibility.

¹ Technical writer is a professional information communicator whose task is to transfer information (knowledge) between two or more parties through any medium that best facilitates the transfer and comprehension of the information.

ELI-Beamlines introduced their ultra-fast radiotherapy device consisting of a pulsed radiation source synchronized with an imaging system and capable of delivering high dose rates (>200 mGy/s) with on-line imaging of the target volume. A talk from CERIC-ERIC on the increasing importance of nano-analytics for pharmaceutical technologies for developing drugs of tomorrow revealed new horizons in pharmaceutical industry.



The presentation from GSI Helmholtz Center for Heavy Ion Research triggered a lively discussion on the synthesis and characterization of metallic nanowires for molecule sensing.

A research group at the University of Hamburg introduced their continuous-flow device for investigation of nanocrystal dynamics through combination of optical spectroscopy and synchrotron-based X-ray techniques. The device capabilities comprise well-defined time resolution

and precise control over reaction conditions.

The production and analysis of nanostructures using ion beams of the MeV energy range was the topic of the talk from the Croatian institute Ruđer Bošković. It gave examples of the application of ERDA (elastic recoil detection analysis) and RBS (Rutherford backscattering) techniques for characterizing thickness and elemental composition of layers with depth resolution down to the 1 nm.

During the discussions, Ian Tracey challenged the audience with a question on the type of support the EU could provide to research. The general opinion was that more actions/measures to increase researchers' mobility and their access to research infrastructures had to be introduced in order to avoid brain-drain from the less developed European countries.



The informal and friendly atmosphere over the two days provided an appropriate environment for networking and cooperation arrangements.

Eleonora Getsova,
HEPTech Communication Officer