

PRESSRELEASE

Exploring Novel Connections: Academia Meets Industry on Nanotechnology and HEP

Nanomaterials and nanotechnology are in the limelight of today's news. Exploratory research in these areas is quickly evolving worldwide and new nanomaterials discoveries are frequently reported across a wide range of applications including nanoelectronics, sensor technologies, drug delivery, robotics, as well as applications in the energy and healthcare sectors. The academia-industry matching event, held on 20-21 October at GSI, in Darmstadt, Germany, explored for the first time novel connections between the nanotechnology and high-energy physics.

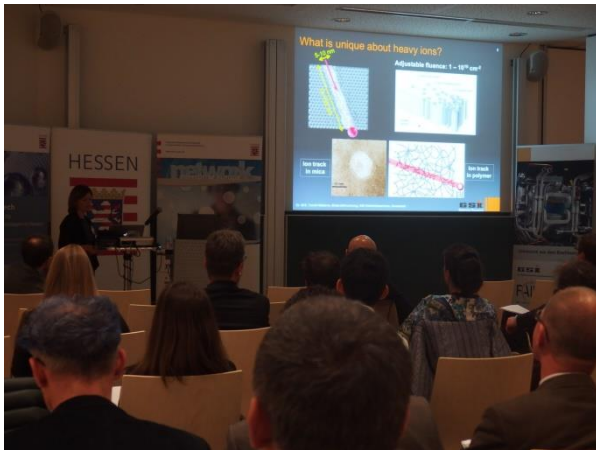
Organizers of this unique forum were GSI together with HEP Tech, in cooperation with the Enterprise Europe Network Hessen, and with the support of NANORA (transnational cooperation network of European nanotechnology regions).

Seventy participants from eleven countries attended the event and thirty bilateral meetings took place.



“This event is the first of its kind but it is clear that it is prone to develop since in the most advanced research, including in particle physics, we are at the very limit of where we can push technologies further. It is clear that nanotech will be one of the main contributors to overcome these limits. Otherwise, we will not meet the targets of the next generation research”, said Jean-Marie Le Goff, the Chairman of HEP Tech, in his opening address. *(Photo: GSI)*

The forum revealed the state-of-the-art in the development of nanotechnologies. It included an overview of the recent experiments at PETRA III - DESY's brilliant hard X-Ray source serving a large user community in many fields of science, including nanotechnology. The focus was on the main strength of the X-rays – their large penetration depth in matter that allows the investigation of physical and chemical processes in-situ and under working conditions.

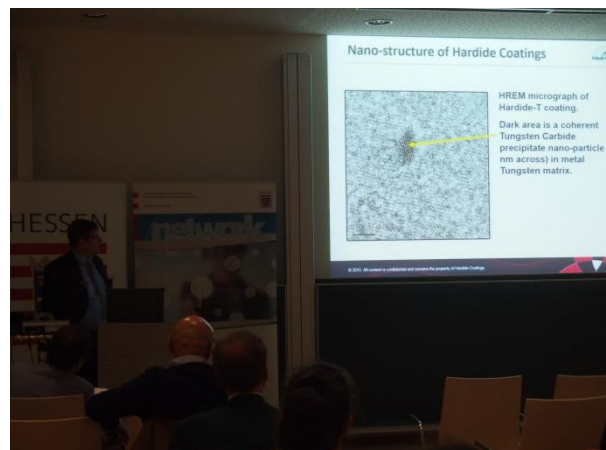


The talk about the activities of the GSI's material research department on nanotechnology highlighted the unique possibilities of the heavy ions of kinetic energy in the MeV to GeV range to modify materials' properties and to produce micro and nanostructures. Various examples were presented such as microfluidic systems and polymeric single-pore membranes for biosensor applications, as well as model systems for ion channels in biomembranes.

Another talk explored the thermal scanning probe lithography (thSPL) as an increasingly reliable method for rapid prototyping of 2D and quasi-3D structures in polymers as well as the mechanism for fabricating nanosystems from bottom-up using capillary assisted nanoparticle assembly. The latter enables for improved, large-scale nanophotonic systems to be built at a very low cost.

Much attention was paid on the production and application of nanostructures. In this context, the achievements of the Ion Beam Center (IBC) of the Helmholtz-Zentrum Dresden-Rossendorf in the field of surface nanostructuring and nanopatterning by low- and medium-energy ion irradiation were introduced. Current examples, demonstrating the potential and limits of ion irradiation for the formation of nanostructures, were explored.

The Hardide Coatings Ltd, UK, presented its advanced surface coating technology, the core of which are the nano-structured tungsten carbide-based coatings. They offer a unique combination of properties making them a promising material for applications in HEP and vacuum engineering, such as in electrodes and electrical connectors, since the coating material has the highest melting and evaporation temperatures among metals and it is a good electrical conductor. Another application area is rotary feedthrough, manipulators and moving metal parts in vacuum where the excellent anti-galling properties and high hardness and wear resistance of the Hardide coatings could be utilized. They can be polished to a mirror finish and being non-abrasive, the coating can reduce the wear of vacuum seals on rotating feedthrough and thus reduce the leaks.



Another talk revealed the key to the successful exploitation of nanomaterials - to design novel nanomaterials with desired properties with end-user's needs in mind, in close collaboration between industry and academia.

Properties of the carbon nanotubes and their potential for utilization in optoelectronics were also discussed in terms of the research objectives to develop nanoscale transducers for future

on-chip data transmission with light, and explore the use of carbon nanotubes as an active element in photonic circuits.

Ion track technology for innovative products, focusing on track-etched polymer membrane filters and on their manufacturing, processing and conversion from raw polymer films up to finished products, tailored to customer applications, was presented by industry. Current R&D projects were considered, with a specific focus on collaborations related to the synthesis of various nanostructures, such as 3D interconnected nanowire networks in micro-battery or gas sensor, artificial nanostructures for performing enzymatic reactions in confinement, hybrid organic/inorganic low-dimensional materials, etc.



In the context of nanoanalytics, neutron research infrastructures and large-scale synchrotrons were described as the most suitable platforms for advanced characterisation of micro- and nano-electronic devices. In this context, the IRT Nanoelec Platform for Advanced Characterisation of Grenoble (PAC-G) was presented, focusing on the use of neutron beams and advanced tools for microelectronics characterization.

Specific focus of the event were the areas of potential collaboration between academia and industry in the application of nanotechnologies for the needs of HEP. CERN presented applications in gaseous detectors using charge transfer properties through graphene.

A medical device company (WISE S.r.l) introduced an innovative technology allowing the metallization of stretchable polymers thus producing a new generation of leads for neuromodulation and neuromonitoring for the treatment of chronic pain and for pre-surgical epilepsy monitoring.

As part of the tailor-made solutions for industry, the Technology Transfer Office of DESY shared their experience in developing a marketing strategy for promoting the services of the DESY NanoLab to companies. The possibilities of the DESY NanoLab in the field of advanced techniques for materials-structuring and analysis on nanoscale, and the different access modes, tailored to the needs of both researchers and industry, were also discussed.



Building bridges between science and industry and networking at regional, national and international level was the focus of the presentation about the Cluster Nanotechnology whose main objective is to maintain and further develop a nanotechnology competence network to support an efficient transfer of latest R&D results from the laboratories into products for the market.



The strong presence and sponsorship from industry proved great expectations in the emerging area of intersection between nanotechnology and HEP. Among the companies represented at the event were Leybold - a world leader in the vacuum industry, and PREVAC - a world leading manufacturer of UHV scientific research instruments and systems for the investigation of chemical and physical properties of solid state surfaces, thin films and nanomaterials. They acknowledged the opportunity to extend their contacts within the HEP community.



establishment that integrates under one roof research and knowledge/technology transfer.

(Photo: GSI)

The business described the event as building a bridge between different communities and creating the right atmosphere for exchange of ideas from which each side could benefit in the future. “It is a wonderful opportunity for matchmaking of companies and scientists in HEP-related technologies. This is the reason why we are sponsoring it and will be happy to participate in similar events in the future”, said Niklas Guenter from TransMIT – an

Both academia and industry representatives left the forum with a set of contacts and collaboration arrangements. This is how Leszek Ropelewski, the prominent researcher from the RD 51 Collaboration at CERN, described his own benefits of the event: “For me this event is very refreshing because it has a completely different subject. I am an expert in the very specific field of detectors development and I try to apply new technologies for application of these detectors. Here, I got a lot of inspiration and ideas and made new contacts. I will have cooperation on a specific project with Oxford, GSI, EPFL, and a company. Since we are doing developments in quite a new field, we need somehow confirmation from the experts in this field that what we are doing is correct. This is the first exposure of our new developments to real experts outside of our own community”.



Group photo of the participants (Photo: GSI)

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