Wirtschaftsförderung
Münster GmbH

NMWP.NRW
Cluster NanoMicroMaterialsPhotonics

7th NRW Nano-Conference

07. and 08. December 2016

Messe und Congress Centrum Halle Münsterland

Ministry of Innovation, Science
and Research of the State
of North Rhine-Westphalia

Welcome to the 7th NRW Nano-Conference

Organiser/Publisher:
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Clustermanager
Dr.-Ing. Harald Cremer

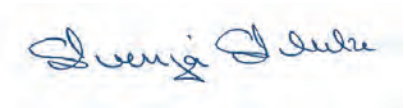
Dear Ladies and Gentlemen,

Progress and development are two key factors if we intent to tackle global challenges such as climate change and energy transition in Germany successfully. This applies in particular to the so-called key enabling technologies, which undoubtedly include nanotechnology. Progress in the application domains "Energy", "Health", "Advanced Materials" as well as "Electronics" is inconceivable without nanotechnology. It provides our society with a range of new opportunities which we are obliged to use successfully and responsibly, thereby creating an important basis for the sustainable development of our living environment.

Hence nanotechnology is, among other key enabling technologies, instrumental in the state's research policy. The highly industrialised federal state of North Rhine-Westphalia has developed specific and unique competences. Combined with our strong and outstanding fields of research they provide a sound basis for innovation. However, this high performance does not only create opportunities. It also involves an increasing responsibility to tackle our societal challenges and to find appropriate solutions in North Rhine-Westphalia in particular.

The 7th NRW Nano-Conference held on December 7th and 8th, 2016 in Münster can make a significant contribution to finding such solutions. This year's conference focuses on the application domains "Health", "Electronics", "New Materials", "Safety and Societal Acceptance", "Energy" and "Nanotechnology as a Business Model". The Congress and the exhibitions provide an excellent opportunity to foster existing collaborations and to establish new contacts.

I wish the 7th NRW Nano-Conference much success. May all participants enjoy this exchange of ideas and have a vivid and exciting time at the conference.



Svenja Schulze
Minister for Innovation, Science and Research of the State of North Rhine-Westphalia

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Dear Ladies and Gentlemen,

I would like to welcome you to the 7th NRW Nano-Conference and I am very pleased that the state of North Rhine-Westphalia chose Münster as venue. At the conference current research and development projects are presented as well as safety issues of nanotechnology will be discussed. Westphalia is a strong „Nanotechnology Region", which we develop in close cooperation with the city of Dortmund and strong support by the state of North Rhine-Westphalia.

Nanotechnology is of great strategic importance for our city. Nanobioanalytics is a focus of Münster's „Alliance for Science", where the Westfälische Wilhelms-Universität Münster, the University of Applied Sciences Münster, local business as well as the city jointly promote the development of Münster as a city of science.
Today about 30 companies with approximately 1,000 employees are working in the field of nanotechnology in Münster and the Münsterland.

I would like to wish all participants a very successful conference in Münster and I am already looking forward to seeing you again at the 8th NRW Nano-Conference in Dortmund in 2018.

Markus Lewe
Mayor of the City of Münster

Dear Ladies and Gentlemen,

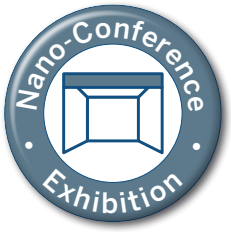
nothing is as constant as change. Accordingly we have refined the format of the Nano-Conference. New in this year is not only the location of Münster, which will be the venue for the event in alternation with Dortmund, but also a number of other modules. In addition to individualized exhibition facilities and sponsoring packages, we expanded the scope of the conference with elements aiming particularly at young scientists. The poster exhibition with more than 100 posters, the Best Poster Award and the Conference Proceedings provide NRW's "Young Academics" with a variety of opportunities to present their research and network with each other.

Also new are the Technical Tours, which offer exciting on-site insights into renowned companies in the industry. In addition, the brokerage event offered for the first time this year will expand your possibilities for individual and predictable networking.
There is so much new to see and experience at the 7th NRW Nano-Conference. But there are things remaining certainly unchanged: the high quality of the lectures and the excellent opportunities for interdisciplinary exchange between academia and industry.

We are looking forward to welcoming you in Münster!

Dr.-Ing. Harald Cremer
Manager ClusterNanoMicroMaterialsPhotonics.NRW

Elements of the 7th NRW Nano-Conference 2016



Exhibition with Best Exhibitor Award

The extensive exhibition of the Nano-Conference offers visitors a platform to learn about products, services and innovations. The Best Exhibitor Award will be presented to the three best exhibitors at the Evening Event. The prizes will be passed on to the winners by a representative of the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia.

Poster Exhibition with Best Poster Award

For the first time a Call for Posters was carried out by the organisers of the Nano-Conference. A selection of more than 100 posters will be presented to accompany the Nano-Conference. The Poster Exhibition takes place in the White Room and its foyer. Within the framework of the Young Academics Sponsoring, the three best posters, which are judged by a jury of experts, are awarded at the Evening Event. The prizes will be passed on to the winners by a representative of the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia.

Young Academics

The Poster Exhibition with more than 100 posters, the Best Poster Award and the Conference Proceedings in the journal "Materials Today“ provide NRW‘s "Young Academics“ with a variety of opportunities to present their research and to network with each other and companies.

Business Pitches

24 exhibitors present themselves in a 240 second talk.
The business pitches take place in the Blue Room on the Ground Floor during the lunch breaks and prior to the Evening Event on the first day.

Matchmaking

The Nano-Conference is the most popular event on the subject of nanotechnology in Germany. The Matchmaking tool allows individual and planned meetings for networking and exchange. The Matchmaking takes place at booth no. 39 on the 1st Floor.

Technical Tours on 9th December 2016

The Technical Tours offer interesting on-site insights into the labs of selected exhibitors. Registration required ahead of the conference. Ask for vacancies.

Topics of the 7th NRW Nano-Conference 2016

Session 1: Health

Demographic development is a major challenge for the health sector. Innovative, nanotechnology-based approaches in regenerative medicine and diagnostic analysis form the basis of future individual therapies. In the field of pharmacy, nanotechnological applications have become increasingly important for drug design and delivery. Medical technology and medical products offer a wide range of optimized procedures based on nanotechnology to maintain and promote health. Nano-health will be dealt within the first session.

Session 2: Electronics

Information and communication technologies have become a decisive factor for industry and the society as a whole. The continuing process of miniaturization as described by Moore's Law has neared its physical limits. New concepts of nano-electronics have to follow a "More than Moore" strategy to open up innovative solutions for entirely new system architectures as well as quantum information technology. In contrast, many products of organic electronics have already found their way into everyday life. Nanotechnology and its applications in electronics / optoelectronics will be the theme of the second session.

Session 3: New Materials

New materials and optimised materials form the basis of two-thirds of all innovations. Because of this, new materials have an enormous impact on future markets and technological advancement. Due to its interdisciplinary nature, nanotechnology creates new impulses for the development of innovative materials and their applications, which are presented in the third session.

Session 4: Safety & Societal Acceptance

Every new technology involves new challenges for mankind and the environment. Risks and hazards must be analysed and socially relevant issues have to be considered adequately. The industrial use of nanomaterials requires an analysis of potential risks related to workplace, end users and the environment. For this reason, a number of projects in industry and universities are relating to safe handling of nanotechnology. The results of these projects and ideas are presented in the fourth session.

Session 5: Energy

Efficient use, conversion, transmission and storage of energy are crucial to enable a long term breakthrough of renewable energy sources. But also the conventional energy supply benefits from numerous research approaches of nanotechnology. This and much more about nano-energy will be the focus of the fifth session.

Session 6: Nanotechnology as a Business Model

Successful entrepreneurs talk about their business cases and describe their view of what makes them and their developed nanotechnology products so successful – from the very first idea via business development and research collaborations to successful commercialisation. In this session young researchers and young entrepreneurs, who have developed an outstanding nanotechnology-based product or process and want to commercialize it, will get insight into strategies of successful corporate development, in marketing and potential uncertainties. This session also provides impetus for young entrepreneurs and founders with a view to successful financing and business strategies for self-employment.

Programme at a Glance

Wednesday, 7th December 2016

08:30 am	Registration	
09:30 am	**Opening of the Exhibition by Minister Svenja Schulze**	
10:30 am	**Welcome addresses by the organisers** **Plenary Talk, Keynote 1, Keynote 2** Plenary Hall / Ground Floor	Plenary Session
12:40 pm	**Exhibition** Ground Floor and 1st Floor **Poster Exhibition** Ground floor **Business Pitches** Blue Room / Ground floor	Lunch Break
02:30 pm	**Health** Refer to on site information **Electronics** Refer to on site information	Parallel Sessions
04:00 pm	**Exhibition** Ground Floor and 1st Floor **Poster Exhibition** Ground floor	Coffee Break
04:30 pm	**Health** Refer to on site information **Electronics** Refer to on site information	Parallel Sessions
05:30 pm	**Poster Session** Gound Floor **Business Pitches** Blue Room / Ground Floor	Coffee Break
06:30 pm	**Evening Event*** Green Hall / 1st Floor * Pre-Registration required Best Exhibitor Award Best Poster Award Wine & Dine & Jazz Music	Plenary Session
09:30 pm	End of the first conference day	

Thursday, 8th December 2016			
08:00 am	Registration		
08:45 am	**Plenary Talk, Keynote 3** Plenary Hall / Ground Floor		Plenary Session
10:00 am	**New Materials** Refer to on site information	**Safety & Societal Acceptance** Refer to on site information	Parallel Sessions
11:10 am	**Exhibition** Ground Floor and 1st Floor **Poster Exhibition** Ground floor		Coffee Break
11:40 am	**New Materials** Refer to on site information	**Safety & Societal Acceptance** Refer to on site information	Parallel Sessions
12:40 pm	**Exhibition** Ground Floor and 1st Floor **Poster Exhibition** Ground floor **Business Pitches** Blue Room / Ground floor		Lunch Break
02:30 pm	**Keynote 4** Plenary Hall/ Ground Floor		Plenary Session
03:20 pm	**Energy** Refer to on site information	**Nanotechnology as a Business Model** Refer to on site information	Parallel Sessions
04:30 pm	**Exhibition** Ground Floor and 1st Floor **Poster Exhibition** Ground floor		Coffee Break
05:00 pm	**Energy** Refer to on site information	**Nanotechnology as a Business Model** Refer to on site information	Parallel Sessions
06:00 pm	End of the conference		

Keynotes

Prof. Dr. Stuart Parkin
Managing Director at the Max-Planck-Institute of Microstructure Physics in Halle and Professor at the Institute of Physics of the Martin-Luther-University Halle-Wittenberg

» Novel computing technologies based on spintronic and ionotronic devices will dawn a new era of 'Beyond Charge!' «

Prof. Dr. Michael Heuken
Vice President Corporate Research & Development AIXTRON SE and Member of the Board of the NMWP Association

» We make small molecules big. My personal motivation here is to convert the research result to the product. «

Prof. Dr. Samuel I. Stupp
Simpson Querrey Institute for BioNanotechnology, Northwestern University, Chicago

» The organization of organic molecules into functional nanostructures offers great potential in biomedical and energy technologies. «

Mostafa Analoui, Ph.D.
Head of Healthcare and Life Sciences at The Livingston Group (New York, NY) and Chairman and CEO of Cense Biosciences, Inc.

» We are witnessing early stages of Nanomedicine product development, with rapidly growing and game-changing pipeline for next generation therapeutics, medical devices, and diagnostic. «

Plenary Session

08:30 am **Registration**

09:30 am **Opening of the Exhibition**

10:30 am **Opening of the Conference**
Greeting and Moderation
Dr.-Ing. Harald Cremer
Manager ClusterNanoMicroMaterialsPhotonics.NRW

Welcome adresses
Svenja Schulze
Minister for Innovation, Science and Research of the State of North Rhine-Westphalia

Markus Lewe
Mayor of the City of Münster

10:50 am **Plenary Talk**
EU Research perspectives and innovation strategy in Nanotechnologies and Advanced Materials.
Hélène Chraye
Head of Unit "Advanced Materials and Nanotechnologies", Directorate General for Research and Innovation, European Commission, Brussels

Keynote 1
Beyond charge currents: spin and ion currents for future computing technologies
Prof. Dr. Stuart Parkin
Managing Director, Max-Planck-Institute for Microstructure Physics, Halle

Keynote 2
Nanotechnology R&D&I in NRW – from Lab to Fab at AIXTRON SE
Prof. Dr. Michael Heuken
Vice President Corporate Research & Development AIXTRON SE

12:40 pm **Lunch Break / Business Pitches**

Business Pitches - 24 exhibitors present themselves in a 240 second talk.
The business pitches take place in the Blue Room on the Ground Floor.

02:30 pm

Session 1: Health

Chair: Dr. Jürgen Schnekenburger

Functional Nanomaterials and Advanced Nanoscopy – Novel Concepts and Application to Nanomedicine
Prof. Dr. Harald Fuchs, WWU Münster/CeNTech

Magnetic Nanoparticles Meet Microfluidics
Prof. Dr. Andreas Hütten, Bielefeld University, Department of Physics

Nanoparticle Imaging in Biological Tissues
Prof. Uwe Karst, WWU Münster

Designing nanocarriers for drug delivery
Dr. Matthias Wacker, Fraunhofer IME

Session 1

04:00 pm — **Coffee Break**

04:30 pm

Functional Porous Nanomaterials: Cell-Material Interaction and Surface Mediated Controlled Drug Delivery
Dr. Nermin Seda Kehr, WWU Münster/CeNTech

Immuno-reactions on Nanostructures
Dr. Kristina Riehemann, WWU Münster/CeNTech

Nanoscale Phenotyping of Skin Health
Dr. Christoph Riethmüller, Serend-ip GmbH

And the beat goes on: Functionality of albumin-derived perfluorocarbon-based artificial oxygen carriers in the Langendorff heart
Anna Wrobeln, Institute for Physiological Chemistry, University Hospital Essen

Session 1

05:30 pm — **Postersession / Business Pitches**

06:30 pm

Evening Event

- Networking
- Wine & Dine & Jazz Music
- Best Poster Award by Young Academics Sponsor
- Best Exhibitor Award

The prizes of the Best Poster Award and the Best Exhibitor Award will be passed on to the winners by a representative of the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia.

09:30 pm — End of the first conference day

02:30 pm

Session 2: Electronics

Chair: Prof. Dr. Manfred Bayer

Graphene for MEMS sensor products: Chances and challenges
Dr. Robert Rölver, Robert Bosch GmbH

Square nano-magnets as bit-patterned media with doubled possible data density
Prof. Dr. Tomasz Blachowicz, Institute of Physics - Center for Science and Education, Silesian University of Technology, Glivice (Poland)

Atomically thin semiconductors light up
Prof. Dr. Rudolf Bratschitsch, WWU Münster/CeNTech

Processing of Self-Aligned Complementary Field-Effect Transistors on Glass and Foil Substrates
Prof. Dr. Ulrich Hilleringmann, University Paderborn

Session 2

04:00 pm — **Coffee Break**

04:30 pm

Fundamental Properties of Semiconducting Nanowires
Prof. Dr. Jia Grace Lu, Department of Physics and Astronomy, University of Southern California

Reconfigurable Nanophotonic Devices Using Phase-change Materials
Prof. Dr. Wolfram Pernice, WWU Münster/CeNTech

Semiconductor Nanowires for Spin-electronics and Quantum Information Circuits
Prof. Dr. Thomas Schäpers, Forschungszentrum Jülich GmbH

Session 2

05:30 pm — **Postersession / Business Pitches**

06:30 pm

Evening Event

- Networking
- Wine & Dine & Jazz Music
- Best Poster Award by Young Academics Sponsor
- Best Exhibitor Award

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09:30 pm — End of the first conference day

08:00 am	**Registration**	
08:45 am	**Greeting and Moderation** **Dr.-Ing. Harald Cremer** Manager ClusterNanoMicroMaterialsPhotonics.NRW **Plenary Talk** **The Action Plan Nanotechnology 2020of the Federal Government – Using the chances and recognising the risks** **Dr. Peter Schroth** Federal Ministry of Education and Research **Keynote 3** **Empowering Cells and Catalysts with Supramolecular Nanostructures** **Prof. Dr. Samuel I. Stupp** Simpson Querrey Institute for BioNanotechnology, Northwestern University, Chicago	Plenary
10:00 am	**Session 3: New Materials** Chair: Prof. Dr. Max Lemme **Self-healing polymers – From nature inspired towards functional materials** Prof. Dr. Ulrich S. Schubert, University Jena **Developing antibacterial nanocoatings for textiles in health care** Prof. Dr. Martin Bennink, Saxion University of Applied Sciences, Enschede (The Netherlands) **Spinnability of Compounded PEEK** Merle Bischoff, ITA RWTH Aachen	Session 3
11:10 am	**Coffee Break**	
11:40 am	**Creation of tailored nanoparticles on large areas for optical devices** Christoph Brodehl, University Paderborn **Complex superparamagnetic particle architectures and their versatile applicability** Dr. Karl Mandel, Fraunhofer ISC **Inline coating of silicon nanoparticles in a plasma reactor: Reactor design, simulation and experiment** Adrian Münzer, University of Duisburg-Essen	Session 3
12:40 pm	**Lunch Break / Business Pitches**	
02:30 pm	**Keynote 4** **Global Investment and Business Landscape in NanoMedicine and Diagnostics** **Mostafa Analoui, Ph.D.** Head of Healthcare and Life Sciences at The Livingston Group, New York, and CEO of Cense Biosciences, Inc.	Plenary

08:00 am	**Registration**	
08:45 am	**Greeting and Moderation** **Dr.-Ing. Harald Cremer** Manager ClusterNanoMicroMaterialsPhotonics.NRW **Plenary Talk** **The Action Plan Nanotechnology 2020of the Federal Government – Using the chances and recognising the risks** **Dr. Peter Schroth** Federal Ministry of Education and Research **Keynote 3** **Empowering Cells and Catalysts with Supramolecular Nanostructures** **Prof. Dr. Samuel I. Stupp** Simpson Querrey Institute for BioNanotechnology, Northwestern University, Chicago	Plenary
10:00 am	**Session 4: Safety and Societal Acceptance** Chair: Dr. Rüdiger Pipke **Safety assessment and innovations should go together to speed up the regulatory acceptance of nanomaterials** Adriënne Sips, Ph.D., National Institute of Public Health & the Environment, Bilthoven (The Netherlands) **Safety assessment of nanomaterials using the DF4nano decision-making framework** Dr. Robert Landsiedel, BASF SE **Silver nanoparticles fighting multidrug-resistant bacteria** Gregor Schneider, RAS AG	Session 4
11:10 am	**Coffee Break**	
11:40 am	**Strategies to assess the potential risk of fibrous (nano)materials** Barbara Simonow, Federal Institution for Occupational Safety and Health, Berlin **Feasible handling of nanomaterial in the aquatic environment – research requirements** Dr. Carmen Nickel, Institute for Energy and Environmental Technologiy IUTA e.V. **Release of and possible exposure to nanomaterials throughout their life cycle** Dr. Burkhard Stahlmecke, Institute for Energy and Environmental Technologiy IUTA e.V. **An Integrative Approach for the Quantitative Detection of Nanoparticles and Biological Markers in Tissues: The NanoBioDetect-Project** Prof. Dr. Martin Wiemann, IBE R&D gGmbH Institute for Lung Health	Session 4
12:40 pm	**Lunch Break / Business Pitches**	
02:30 pm	**Keynote 4** **Global Investment and Business Landscape in NanoMedicine and Diagnostics** **Mostafa Analoui, Ph.D.** Head of Healthcare and Life Sciences at The Livingston Group, New York, and CEO of Cense Biosciences, Inc.	Plenary

Session 5: Energy

Chair: Prof. Dr. Henning Zoz

03:20 pm

Development of nanosized photocatalysts for CO_2 reduction and water splitting
Dr. Jennifer Strunk, Max-Planck-Institute for Chemical Energy Conversion

Process-stable, highly pure nanomaterials for energy research made by scalable, continuous laser production
Prof. Dr. Stephan Barcikowski, University of Duisburg-Essen

Laser applications for the production of supercapacitors and solid-state batteries
Dr. Arnold Gillner, Fraunhofer Institute for Laser Technology ILT

Session 5

04:30 pm **Coffee Break**

05:00 pm

Electrically and thermally conductive polymers for fuel cells and batteries
Marco Grundler, ZBT GmbH

Influence of Catalyst Support Composition in PEM Fuel Cell Electrodes Utilizing Plasma Treated Graphene Related Material Decorated with Platinum Nanoparticles
Pit Yannik Podleschny, University of Applied Science Gelsenkirchen

Highly specific nanoparticles: A chance for future energy applications
Tim Hülser, IUTA e.V., Duisburg

Fabrication of Nanoporous Cellulose Aerogel Fibres for Fuel Saving in Hybrid Diesel Engines
Dr. Gunnar Seide, ITA, RWTH Aachen

Session 5

06:00 pm **End of the conference**

Technical Tours on 9th December 2016
The Technical Tours offer interesting on-site insights into the labs of some exhibitors.

Registration required ahead of the conference.
Ask for vacancies.

Session 6: Nanotechnology as a Business Model

Chair: Andrea E. Reinhardt

03:20 pm

20 years "naked in the wind" – with high-tech to world leadership
Dr. Thomas Fries, FRT GmbH

Innovative sales strategies – How does the Micronit product line find its customers?
Dominique Bouwes, Micronit GmbH

SmartMembranes GmbH – Strategies for Growth and Internationalization
Monika Lelonek, SmartMembranes GmbH

Session 6

04:30 pm **Coffee Break**

05:00 pm

Carbon Nanomembranes, the Other Carbon-Based 2D-Material – Use in Gas Separation and Ultrafiltration
Dr. Albert Schnieders, CNM Technologies GmbH

From University to Business: Start-up Funding in NRW
Dr. Hendrik Vollrath, Projektträger Jülich

Nanobay – From the Idea to the Market Launch
Prof. Dr. Gregor Luthe, nanobay - NB GmbH

Session 6

06:00 pm **End of the conference**

Technical Tours on 9th December 2016
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EU Research perspectives and innovation strategy in Nanotechnologies and Advanced Materials

Hélène Chraye
Head of Unit "Advanced Materials and Nanotechnologies",
Directorate General for Research and Innovation,
European Commission, Brussels

Plenary 7th December 2016

The Action Plan Nanotechnology 2020of the Federal Government – Using the chances and recognising the risks

Dr. Peter Schroth
Federal Ministry of Education and Research

Plenary 8th December 2016

Functional Nanomaterials and Advanced Nanoscopy – Novel Concepts and Application to Nanomedicine

Prof. Dr. Harald Fuchs, WWU Münster/CeNTech

Functional nanomaterials exhibit specific electronic and optical properties which are depending on their size and shape, and which cannot be detected with macroscopic objects made of the same chemistry. Therefore, these systems are of high interest for the generation of novel diagnostic and targeting in Biomedicine. Examples for the application of advances scanning probes and the generation of biomimetic nanostructures by DPN-Lithography for the generation of biomimetic systems and nano-medical diagnostics will be discussed.

Session 1

Magnetic nanoparticles meet microfluidics

Prof. Dr. Andreas Hütten, Bielefeld University, Department of Physics

Lab-on-a-chip immunoassays utilizing superparamagnetic beads as labels allow for transport, separation and detection of different bead species by employing magnetic strayfield landscapes and/or special channel geo-metries in microfluidic systems in combination with integrated magnetoresistive sensors. Moreover, the formation of magnetic bead superstructures due to dipolar magnetic interactions can be applied as configurable matter so as to realize programmable microfluidic functions such as mixers, filters or valves which are able to simultaneously detect biomolecule via molecular recognition.

Session 1

Nanoparticle Imaging in Biological Tissues

Prof. Dr. Uwe Karst, WWU Münster

New imaging methods for the analysis of biological tissues upon exposure to nanoparticles have been developed. Elemental bioimaging by means of laser ablation coupled to inductively coupled plasma-mass spectrometry (LA-ICP-MS) or microscale X-ray fluorescence spectroscopy (µXRF) is a capable strategy for the investigation of metals in biological samples. The high sensitivity and excellent detection limits of the methods permit the determination of elements in low concentration ranges. Matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS) imaging provides complementary molecular information. The elemental concentration in thin tissue slices of rat organs, including lung, kidney, liver and spleen. Furthermore, individual nanoparticles as well as their size distribution in the tissue could be determined using dedicated detection techniques in LA-ICP-MS. Finally, it was shown by these methods that macrophages strongly accumulate nanoparticles in the tissues. Spatially resolved phospholipid profiles were obtained by MALDI-MS and indicated a fibrosis of the tissue upon delivery of silica nanoparticles.

Session 1

Designing nanocarriers for drug delivery

Dr. Matthias Wacker, Fraunhofer IME, Frankfurt/Main

In recent years, nanotechnology has emerged as a global industry. Nanocrystals and nanocarriers have been utilized to increase the bioavailability of poorly soluble compounds or to deliver drug substances to a specific site of action. Translating such approaches into new drug products has been a challenge to the existing technologies. Strategies towards a rational design of nanocarriers and the translation of nanoparticle formulations from small to medium-scale will be highlighted. Further, in vitro release testing as an efficient tool for refinement and optimization of drug delivery devices will be presented.

Session 1

Functional Porous Nanomaterials: Cell-Material Interaction and Surface Mediated Controlled Drug Delivery

Dr. Nermin Seda Kehr, WWU Münster/CeNTech

In biotechnology, self-assembled monolayers (SAM) and nanocomposite (NC) hydrogels of functional porous nanomaterials are of high interest and used as two dimensional (2D) and three dimensional (3D) biomaterials, respectively, to mimic natural extracellular matrix (ECM) and to control cell behaviors. Besides the nanostructured character of nanomaterials we used the spatial controlled external and internal surface functionalization of porous nanomaterials as an additional tool to mimic ECM and to control the cell/material surface interactions. We described the external and internal surface functionalization of nanomaterials with bioactive molecules and fluorescence dye molecules, respectively, preparation of their SAM and NC hydrogels for controlled cell adhesion, cellular patterning, cell-cell separation, and cell enrichment. Additionally, we utilized fluorescence dye loaded porous nanomaterials as nanocontainers for surface mediated drug delivery application. SAM or NC hydrogels of these nanomaterials support cell adhesion and simultaneously control the release of organic molecules under external stimuli (pH change) to adhered cells.

Session 1

Immuno-reactions on Nanostructures

Dr. Kristina Riehemann, WWU Münster/CeNTech

Nanomaterials are widely used for nano-medical applications including magnetic resonance imaging, biological sensing and drug delivery just to mention a few. Macrophages are important components of the innate immune answer, among other functions they control inflammatory reactions of the body to foreign material. In an ex vivo model of the blood stream we demonstrated the interaction of nanoparticles with cells. We also described the characterization of the nanoparticles protein corona followed by evaluation of cytokine production after interaction of nanoparticles with macrophages of the peripheral blood. In addition we investigated the mechano-elastic properties and the activity of ion channels after contact of the primary macrophages and leukemic cell lines with different types of particles to investigate the biophysical effects underlying these changes. Thus, we described different biophysical and biochemical processes altered in human macrophages after contact with nanoparticles, demonstrating cellular changes beyond toxicity.

Session 1

Nanoscale Phenotyping of Skin Health

Dr. Christoph Riethmüller, Serend-ip GmbH, Münster

Non-invasive skin cell-based assay DERMATACT: Diseases of the skin are often chronic, but still today, clinical diagnostics remain confined to mere inspection. The start-up company Serend-ip offers an objective method to assess the skin status using a nanoscale topometry method (nAnostic[a]). Patient samples are obtained non-invasively using tapestrips, preferably from non-lesional sites. Atomic Force Microscopy (AFM) records the cellular topography of corneocytes at the nanoscale. Structural elements are quantitated label-free at attoliter accuracy using patented algorithms. The ultrastructure count is a good measure for (subclinical) inflammation and/or reduced barrier function. The Dermal Topographic Index (DTI) correlates well to the clinical score of atopic dermatitis, SCORAD), but is more exact. Hence, clinical testing of pharmaceutic therapies, skin irritants or cosmetic applications can be performed at higher sensitivity - or in a shorter time period. The DERMATACT-analysis is offered as a lab service for scientific cooperation projects.

Session 1

And the beat goes on: Functionality of albumin-derived perfluorocarbon-based artificial oxygen carriers in the Langendorff heart

Anna Wrobeln, Institute for Physiological Chemistry, University Hospital Essen

Because no artificial oxygen carrier is clinically approved in the EU or USA, albumin-derived perfluorocarbon-based nanocapsules (nanocapsules) were designed as a new opportunity. Our nanocapsules lack any chemical emulsifier, co-responsible for side effects in other products. The aim of this study was to examine the functionality of the nanocapsules in a Langendorff perfusion apparatus. Rat hearts were perfused with a modified Krebs Henseleit (KH)-buffer in the absence or presence of nanocapsules as artificial oxygen carriers. In different protocols the abilities to deliver oxygen and remove carbon dioxide were tested. The left ventricular developed pressure and the rate pressure product were determined.

In all protocols hearts perfused with modified KH-buffer in the presence of nanocapsules showed increased left ventricular developed pressure and rate pressure product compared to control hearts. Due to their oxygen and carbon dioxide transport capacity nanocapsules preserve the beat of rat hearts much better than modified KH-buffer does.

Session 1

Graphene for MEMS sensor products: Chances and challenges

Dr. Robert Rölver, Robert Bosch GmbH/Corporate Research, Renningen

Graphene, the 2D material with very promising mechanical and electrical properties has now reached a level of maturity where an industrial , engagement is necessary on the way to commercialization.
Bosch, the worldwide largest manufacturer of MEMS sensing devices is now a part of the growing number of companies and startups looking into graphene applications and large scale fabrication routes for graphene synthesis. In terms of wafer based fabrication there is still a need for improvement of the commonly used graphene synthesis process based on layer transfer techniques including wet processing. An overview of possible methods and current progress in this field will be covered in the presentation. In terms of applications, Bosch corporate research has started first collaborations with the academia to evaluate the potential of graphene for sensor applications. Here, Bosch currently focuses on magnetic sensing. The two-dimensional material graphene exhibiting substantially higher charge carrier mobility seems to be predestined for use in magnetic field sensing. Neglecting all extrinsic sources of disorder, the phonon scattering limited mobility of graphene can surpass 100,000 cm^2/Vs at room temperature at a reasonably low charge carrier density of 10^{12} cm^{-2}, exceeding all other common material candidates for Hall sensing.

Session 2

Square nano-magnets as bit-patterned media with doubled possible data density

Prof. Dr. Tomasz Blachowicz, Institute of Physics – Center for Science and Education, Silesian University of Technology, Gliwice (Poland)

Due to their possible applications in magneto-electronic devices, nanostructured magnetic particles are one of the most important topics in recent research. In such low-dimensional particles, the shape anisotropy can significantly be increased, compared with magneto-crystalline and magneto-elastic anisotropies – and thus allows for tailoring magnetic properties by shape design. Especially square nanowire systems which can lead to stable intermediate states are of technical relevance.
Such systems could be used as quaternary memory cells, i.e. for storing 2 bits per storage position, expanding the possible limits of Moore's law. Recent experimental investigations have revealed the influence of lateral dimensions, wall thicknesses, corner shapes, etc. on magnetization reversal mechanisms and corresponding hysteresis loop shapes, supported by micromagnetic simulations of such systems.
The presentation will provide an overview of previous theoretical and experimental results and give an outlook to possible implementation of these nano-particles in novel hard-disk or MRAM technology.

Session 2

Atomically thin semiconductors light up

Prof. Dr. Rudolf Bratschitsch, WWU Münster/CeNTech

Graphene is known as a prototypical two-dimensional material with unique physical properties. However, the difficulty of creating an optical band gap stimulated the search for other monolayer materials. In my talk I will show that atomically thin transition metal dichalcogenides serve as a promising new material class for opto-electronics and quantum optics.

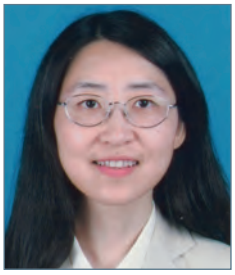
Session 2

Processing of Self-Aligned Complementary Field-Effect Transistors on Glass and Foil Substrates

Prof. Dr. Ulrich Hilleringmann, Sensor Technology Department, University Paderborn

Key issues for flexible complementary electronics are low temperature processing, sufficient performance of the integrated p- and n-type FET devices, and cheap semiconducting and dielectric materials. Organic semiconductors commonly depict p-type behavior, whereas metal oxide semiconductors show n-type characteristics. In this paper a new approach for common integration of organic and ZnO transistors on transparent substrates for complementary transistor electronics is presented. The gate dielectric consists of a special high-k resin, the metallization utilizes Au, Ag or Al films. The thermal budget for processing of the devices is limited to 150°C to enable foil substrates.

Session 2



Fundamental Properties of Semiconducting Nanowires

Prof. Dr. Jia Grace Lu, University of Southern California, Department of Physics and Astronomy

Nanowires exhibit novel physical properties owing to their large surface-to-volume ratio. They are the potential building blocks for a wide range of device applications. We have synthesized and studied a variety of semiconducting nanowires. Some of their basic structural, electrical, and optical properties will be highlighted. A particular interesting system is Sb2Te3 which belongs to a new class of material - topological insulators (TI). It has an insulating bulk, but gapless Dirac cone surface states with spin-momentum locking carriers. Magnetoresistance on these wires with different cross-sectional areas are cross-examined with nanoscale angle-resolved photoemission spectroscopy, elucidating their remarkable topological surface states. In outlook, a powerful experimental tool will be to utilize single electron Coulomb blockade to explore coexisting effects of coherence, confinement and spin-orbit coupling in these TI nanowires.

Session 2

Reconfigurable Nanophotonic Devices Using Phase-change Materials

Prof. Dr. Wolfram Pernice, WWU Münster/CeNTech

Nanophotonic integrated circuits allow for realizing functional optical devices using efficient design and fabrication routines. Their inherent stability and scalability makes them attractive for applications where optical signal processing is combined with coupling to external light stimuli. A majority of nanophotonic devices is, however, based on passive materials, which do not provide low-power tuning options or knobs for reconfigurability. We address this shortcoming by combining passive silicon nitride photonic devices with tunable phase-change materials. Such a platform allows realizing both on-chip optical data storage and active photonic components. Furthermore, multi-level photonic memories with random access would allow for leveraging even greater computational capability. We exploit hybrid photonic-phase-change materials to implement robust, non-volatile, all-photonic memories. We show that individual memory elements can be addressed using a wavelength multiplexing scheme. Such multi-level, multi-bit devices provide a pathway towards eliminating the von Neumann bottleneck and portend a new paradigm in all-photonic memory and non-conventional computing. We further show that such devices can be operated with short optical pulses, both for write and read operations.

Session 2

Semiconductor Nanowires for Spinelectronics and Quantum Information Circuits

Prof. Dr. Thomas Schäpers, Peter Grünberg Institut 9, Forschungszentrum Jülich

Semiconductor nanowires are very promising as building blocks for future nanoscaled devices. This includes cutting-edge transistor concepts, like nanowire-based gate-all-around transistors or tunnel field effect transistors. In order to enhance the device performance, often III-V semiconductors, i.e. InAs or InSb, are employed.
However, semiconductor nanowires are also interesting for devices going beyond conventional switching schemes. Here, we will focus on two more explorative research areas, namely semiconductor spintronics and quantum information technology. We will give a review on our efforts to implement semiconductor nanowires in spintronic devices. In quantum information technology a revolutionary different scheme is employed for information processing. Utilizing specific quantum mechanical properties, such as entanglement, promises to enable solutions of computational problems which are unsolvable by classical computers. We will present concepts of realizing elements for quantum information circuits based on semiconductor nanowires.

Self-healing polymers – From nature inspired towards functional materials

Prof. Dr. Ulrich S. Schubert, Laboratory of Organic and Macromolecular Chemistry (IOMC), Friedrich Schiller University Jena

Biological materials feature a wide range of outstanding properties, which helps to survive under the natural circumstances. Among others, self-healing, the possibility to recover the original mechanical properties after a damage event, is very interesting and was the basis for an effort enormous research during the last years.In the current contribution several strategies to synthesize artificial self-materials are presented. Therefore, different kinds of reversible reactions were utilized ranging from dynamic covalent ones (e.g., Diels-Alder reaction) to supramolecular motifs (i.e. metallopolymers). After the synthesis, the polymer networks were tested regarding self-healing abilities and the preconditions as well as the crucial parameters for the design of such materials were evaluated. Additionally, the healing mechanisms were studied in detail offering the possibility to tune the properties further and to obtain the next generation of self-healing materials.

Session 3

Developing antibacterial nanocoatings for textiles in health care

Prof. Dr. Martin Bennink, NanoBioInterface Group, Saxion University of Applied Sciences, Enschede (The Netherlands)

Bacterial infections within hospitals and other health care institutions are a serious problem, which lead to complications in the treatment of patients, and thus additional costs. In this project we have synthesized nanoparticles, which are subsequently applied using various methods to the different types of textile: cotton, polyester and a blend of the two. Initial results show that application on cotton is successful, and high antibacterial activity can be achieved. First results show that there is some skin irritation if the concentration of nanoparticles is too high. We are now in the process of optimizing the concentration to have sufficient antibacterial effect, but such that the skin flora is not affected significantly.

Session 3

Spinnability of Compounded PEEK

Merle Bischoff, ITA, RWTH Aachen

Poly-ether-ether-ketone (PEEK) is a high performing polymer that is been widely used in tribological applications. The tribological properties of PEEK can be further enhanced by additives Lubricants such as Poly-tetra-fluoro-ethylene (PTFE) and Graphite are proven to improve the tribological properties of PEEK. Also addition of nanoparticles such as Titanium dioxide (TiO_2) and Zinc sulphate (ZnS) are known to improve the mechanical and tribological properties. However the compounded PEEK is so far tested as an injection moulded part only. Producing compounded PEEK as fibre for textiles opens up the opportunity for a variety of applications. Hence the idea of this work is to spin compounded PEEK and to test the properties of the final filaments. Within this study 4 compounds are investigated for their spinnability properties.
For all trials Ketaspire KT-851 (1,30 g/cm3), manufactured by Solvay Specialty Polymers, Brussels, Belgium is used.

Session 3

Creation of tailored nanoparticles on large areas for optical devices

Christoph Brodehl, CeOPP – Center for Optoelectronics and Photonics Paderborn, University Paderborn

Metasurfaces are a new and artificial class of optical materials, which can be tailored to show exceptional optical behaviour. Metallic nanoparticles interacting with light like small antennas are needed. Their dimensions have to be in the order of the wavelength of light. Therefore, they are typically fabricated by electron beam lithography techniques, which are highly accurate and flexible, but at the same time very expensive and slow. Nanosphere lithography instead is a method to pattern large-area samples fast and cost-efficiently. Here we show how the capabilities of this technique can be expanded by making few changes at the experimental setup. Thus, on the one hand the fabrication of nearly arbitrarily designed nanoantennas and on the other hand the segmentation of the sample in several areas, each patterned with a unique type of such nanoantennas, gets possible. Arrangements of such structured areas can act like optical, metasurface-based devices.

Session 3

Complex superparamagnetic particle architectures and their versatile applicability

Dr. Karl Mandel, Head of Particle Technology, Fraunhofer ISC, Würzburg

Ways to tailor the magnetic properties of iron oxide based nanoparticles by controlling their size, shape and composition will be shown. Their application potential in fields such as water purification, substance targeting and recovery will be presented. Highly fascinating optical effects, triggered by magnetic manipulation of nanoparticle suspensions, demonstrate the future potential obtainable from creating complex architectures from magnetic nanoparticle building blocks.

Session 3

Inline coating of silicon nanoparticles in a plasma reactor: Reactor design, simulation and experiment

Adrian Münzer, IVG, Institute for Combustion and Gas Dynamics – Reactive Fluids, University of Duisburg-Essen

Gas-phase synthesis of nanoparticles (NPs) in hot plasmas is a highly promising approach to produce pure, highly specific, and complex nano-materials with large quantity. Post-processing by particle coating, embedding, or surface functionalization is often required to adjust the materials' properties with respect to their utilization in functional structures. We report on a scalable and continuous gas-phase synthesis with subsequent inline coating of silicon nanoparticles by a high-temperature single-step plasma process. The process requires a two-stage supply: Firstly, Si-NPs are formed from the particle precursor silane (SiH4) in the plasma zone. Secondly, a coating agent, e.g., ethylene (C_2H_4) is mixed with the hot particle-laden gas flow via a well-designed coating nozzle. A wide range of process conditions can be varied to tune nucleation/decomposition of gaseous C_2H_4 on the pristine Si-NP surface. The generated materials are of specific interest, e.g., as components of anodes for lithium-ion batteries. XPS measurements indicated that silicon nanoparticles coated close to the plasma zone react with the ethylene forming crystalline silicon carbide (SiC). This is attributed to the energy provided by free radicals, ions, and electrons shortly after the plasma zone and by the high reactivity and temperature of the pristine nanoparticles. For all process conditions, spherical, non-aggregated particles of about 40 nm in diameter with a highly-crystalline silicon core were observed as indicated by TEM measurements.

Session 3

Safety assessment and innovations should go together to speed up the regulatory acceptance of nanomaterials

Adriënne Sips, Ph.D., National Institute of Public Health & the Environment, Bilthoven (The Netherlands)

Safe-by-design (SbD) is not new, the method has been used for years by the industry to minimize the toxicity of products. The SbD concept is tuned towards timely identification of uncertainties and potential risks as well as timely measures to reduce or eliminate these uncertainties and risks during an innovation project. SbD is not a stand-alone concept: it is designed so that it can be seamlessly integrated into current industrially used innovation processes. In essence, designers and developers of new nanomaterials should include toxicological expertise in a very early stage, rather than waiting under risk assessment has to be performed prior to bringing a product to the market. More than a decade of research on the toxicological potential of nanomaterials will allow us now to give guidance with some general principles. For example the aspect ratio of fibre like structures is very predictive for the development of mesothelioma (like the classical asbestos-induced cancer). Size, shape, solubility, number of particles that will be in contact with the biological system will all have their implications for the development of adverse health outcomes.
A better design of products and better business models.

The work presented is in part based on the EU project NANOREG (www.nanoreg.eu)

Session 4

Safety assessment of nanomaterials using the DF4nano decision-making framework

Dr. Robert Landsiedel, BASF SE,
Experimental Toxicology and Ecology, Ludwigshafen am Rhein

The European Centre for Ecotoxicology and Toxicology of Chemicals (ECETOC) proposes a Decision-making framework for the grouping and testing of nanomaterials (DF4nano). The DF4nano covers all relevant aspects of a nanomaterial's life cycle and biological pathways: intrinsic material and system-dependent properties, biopersistence, uptake and biodistribution, cellular and apical toxic effects. The four main groups encompass (1) soluble, (2) biopersistent high aspect ratio, (3) passive, and (4) active nanomaterials. The DF4nano foresees a stepwise evaluation of nanomaterial properties and effects with increasing biological complexity: As necessary, intrinsic material properties, system-dependent properties (e.g. surface reactivity and dispersibility) and in vitro effects (preferably using alveolar macrophages) are assessed.
The DF4nano facilitates grouping and targeted testing of nanomaterials. It ensures that sufficient data for grouping and ultimately risk assessment of a nanomaterial are available, and it fosters the use of non-animal methods.

Session 4

Silver nanoparticles fighting multidrug-resistant bacteria

Gregor Schneider, RAS AG, Regensburg

Silver is a well-known antiinfective agent, used since ancient times.
It could be shown, that silver nanoparticles have excellent antimicrobial properties even against most threatened multidrug-resistant germs.
RAS AG is producing different nanosilver qualities for all kind of water-based or solvent-based formulations to incorporate the particles permanently in relevant surfaces. Depending on the surface, the bacterial reduction is up to log 5 within hours. Silver nanoparticles create an additional protection besides antibiotics and disinfecting agents, but no substitution of these is intended.
Research projects have shown the benefits of using nanosilver: not only by preventing healthcare associated infections but also in having a better environmental impact than non-nano-biocides.
European Biocide product regulation demands additional nanospecific risk assessment data. RAS AG produces the official nanosilver reference material (NM 300 K) for the "OECD WPMN -sponsorship program" to collect all relevant data on exposure, human and ecological toxicity.
Other studies have shown, that nanosilver particles have always been present on any surface made of bulk silver.

Session 4

Strategies to assess the potential risk of fibrous (nano)materials

Barbara Simonow, Federal Institution of Occupational Safety and Health (BAuA), Berlin

The morphology and biopersistence of fibrous nanomaterials like carbon nanotubes (CNT) and carbon nanofibers (CNF) have raised concerns about potential lung carcinogenicity. While handling fibrous nanomaterials, respirable particles with critical WHO fiber shape (lengths > 5µm, diameters < 3 µm and aspect ratio >3:1) can potentially be released.

To assess the inhalation risks, it is mandatory to characterize the released particles and to determinate typical inhalation exposure levels. Especially the number of WHO fibers needs to be identified.
In Germany, a WHO fiber concentration of 0.01 Fibers/cm³ is recommended for the handling of fibrous nanomaterials. However, the determination of such a low concentration is challenging. Therefore, BAuA has developed a measurement and classification strategy for nanofibers based on the scanning electron microscopic (SEM) analysis of air samples.
It is intended to form the basis for future regulation

Session 4

Feasible handling of nanomaterial in the aquatic environment – research requirements

Dr. Carmen Nickel, Institute of Energy and Environmental Technology (IUTA) e.V. Duisburg

A challenge of nanomaterial application in products is their optimal use and at the same time the safe handling for humans and the environment. Several studies showed the release of NM during their life cycle. One exposure pathway is the release into the waste and surface water.

The properties of the nanomaterial itself for example a coating as well as the environmental parameter (e. g. pH, ionic strength or type and con-centration of natural organic matter) will influence the further behaviour like the agglomeration or stability in the media and its bioavailability for different organisms. Due to this an under standing of the environmental behaviour is very important for a wide risk assessment and for further handling strategies.

In this presentation the effect of different parameters on the behaviour of nanomaterials in aquatic media and strategies for future risk assess-ment will be presented.

Session 4

Release of and possible exposure to nanomaterials throughout their life cycle

Dr. Burkhard Stahlmecke, Institute of Energy and Environmental Technology (IUTA) e.V. Duisburg

A release of nanomaterials (NM) during production, further processing and handling, during the use phase and at the end of life has been observed and much work has been conducted to assess the exposure to NM due to concerns on possible risks stemming from their production, use and, more recently, their end-of-life phase.

Whereas exposure measurements are established in occupational settings they are less so during other stages of the life cycle. Also, the actual release as a prerequisite of exposure, processes involved and (material) parameters influencing the release are much less investigated. Available studies on release pinpoint often only the release of a given material during a special test with fixed conditions. The link between release and exposure as well as the establishment of representative test methods simulating real life conditions are therefore still needed to provide a mechanistic understanding, especially in view of the emission into different compartments.

Session 4

An Integrative Approach for the Quantitative Detection of Nanoparticles and Biological Markers in Tissues: The NanoBioDetect-Project

Prof. Dr. Martin Wiemann, IBE R&D gGmbH Institute for Lung Health, Münster

Local effects of nanoparticles (NP) inside the body are still a matter of debate. The project is, therefore, dedicated to the localization of a large variety of NP inside animal tissue. Starting with early protein adsorption by NP inside the lung the project extents to NP distribution studies in tissue from long term inhalation studies. Quantitative estimates of NP concentration shall be developed for identified cells in tissues along with local biological effects. Optimized methods shall combine immunocytochemical staining with e.g. hyperspectral microscopy, confocal Raman microspectrometry, ToF-SIMS, LA-ICP-MS, and ion beam microscopy. Nearly all these techniques are provided by North Rhine-Westphalian project partners (IonTOF GmbH, Tascon GmbH, Medical Physics and Biophysics (Univ. of Leipzig), Analytical Chemistry (Univ. of Münster), Biomedical Imaging Group (Univ. of Applied Sciences, FH Dortmund), OxProtect GmbH, Pathology (Univ. Bochum)). Eventually, the results shall be converted into meaningful approaches for refined in vitro testing of nanoparticles.
The NanoBioDetect-project (www.nanobiodetect.de) is sponsored by BMBF (FKZ 03X0146)

Session 4

Development of nanosized photocatalysts for CO2 reduction and water splitting

Dr. Jennifer Strunk, Max-Planck-Institute for Chemical Energy Conversion, Mülheim/Ruhr

It would be a milestone in the availability of renewable energy if the reduction of CO2 to methanol or methane, or the splitting of water for the generation of hydrogen could be implemented with just the light of the sun as energy source. However, in spite of roughly 40 years of research, no industrially applicable system has yet been developed for those processes.

Our approach highlighted in this contribution is the detailed understand of working, yet impractical systems for those reactions. The insight thus generated is used for the development of new nanomaterials overcoming the bottlenecks in existing systems. Quantum-size effects in nanomaterials are also considered. The talk will highlight studies of the mechanism of photocatalytic CO2 reduction on nanosized titania-based photocatalysts. As the concomitant oxygen evolution appears to be the rate-limiting step in this process, we aim at developing new nanosized manganese- and vanadium-based photocatalysts to facilitate oxygen liberation.

Session 5

Process-stable, highly pure nanomaterials for energy research made by scalable, continuous laser production

Prof. Dr. Stephan Barcikowski, Technical Chemistry and Center for Nanointegration Duisburg-Essen (CENIDE), University of Duisburg-Essen and NanoEnergieTechnikZentrum (NETZ), University of Duisburg-Essen

Pure inorganic nanoparticles without ligands or stabilizers fabricated by laser ablation in liquid are promising materials for energy converting materials like heterogeneous catalysts or hydrogen storage materials . Especially in case of heterogeneous catalysts, common preparation techniques like impregnation or colloidal deposition are usually accompanied by extensive use of chemical precursors, stabilizers and ligands that may result in catalysts poising. In our recent work, we showed how to synthesize colloidally stable and size-controlled nanoparticles made of catalytic active materials (e.g. Pt, Au, Pd, Ni). For this purpose, an intensive pulsed laser beam is focused onto an immersed target of chosen nanoparticle material. Properties of pure, colloidal nanoparticles like particle size can be controlled by use of saline solutions.
These colloidal particles can be supported by attractive electrostatic interactions to carrier structures like metal oxides and carbon allotropes for synthesis of heterogeneous catalysts. First catalytic tests of laser-generated nanomaterials has proved its potential to active and stable catalysts.

Session 5

Laser applications for the production of supercapacitors and solid-state batteries

Dr. Arnold Gillner, Fraunhofer Institute for Laser Technology ILT, Aachen

In energy applications like supercapacitors and solid state batteries, high precision modifications of the active material are necessary for excellent product performances. This can be achieved by the use of laser radiation offering high temporal and spatial resolution and a selective energy deposition. The fast heating rates (~ 50 K/s) during laser carbonization of polyacrylonitrile nano fibre fleeces lead to high specific surface areas (~ 500 m^2/g) of carbon nano fibre fleeces.
These hierarchical structured fleeces with fibre diameters of around 150 nm are an ideal solution for supercapacitors. Also flexible patterning of anode, cathode and battery layers can be realised by using modern ultrashort-pulsed laser systems. A depth-selective ablation allows the creation of isolating paths or cuts and can be used to expose contact areas.

Session 5

Electrically and thermally conductive polymers for fuel cells and batteries

Marco Grundler, ZBT GmbH, Duisburg

Functionalized polymers in general are claiming more and more novel applications for example they can function as a metal replacement. To functionalize an intrinsic isolating polymer high loadings of conductive fillers, like graphite, carbon blacks, CNTs, metals and/or others, are necessary. The mixtures, the so called compounds expose a significant different behavior in processing and in their properties compared to the neat polymer which will be disclosed in the paper. Thus the paper focusses on the development of electrically and thermally very good conductive thermoplastic compounds for bipolar plates in fuel cells, battery stacks or heat exchange applications. Besides the compounding process to produce conductive granulates for further processing by injection molding also novel & innovative direct extrusion of semi-finished products like sheet extrusion or a roll-to-roll process for film extrusion of these conductive materials will be presented.

Session 5

Influence of Catalyst Support Composition in PEM Fuel Cell Electrodes Utilizing Plasma Treated Graphene Related Material Decorated with Platinum Nanoparticles

Pit Yannik Podleschny, Westphalian Energy Institute, University of Applied Sciences, Gelsenkirchen

This work deals with the preparation and investigation of PEM fuel cell electrodes, which are obtained using graphene related material (GRM) serving as catalyst support for platinum nanoparticles. Applied GRM are used for the preparation of suspensions in four distinct mixing ratios. Two sorts of GRM have been investigated: carbon nanofibers (CNF) and graphene oxide (GO). Utilized CNFs provide a superior graphitization degree of about 100%, which leads to both high corrosion resistance and low ohmic resistance in PEM fuel cells.
For electrode preparation a GRM containing layer serving as catalyst support is applied onto a gas diffusion layer (GDL). Prior to GRM suspension and deposition onto a GDL, the graphene structures are functionalized by plasma treatment. Due to this step, an improved hydrophilic behavior for facilitating suspension preparation is achieved. In addition, a subsequent platinum nanoparticle deposition by pulsed electrodeposition process is optimized.

Session 5

Highly specific nanoparticles: A chance for future energy applications

Tim Hülser, IUTA, Institute for Energy and Environmental Technology, Duisburg

The growing demand for energy in the future and the limited fossil resources, require new and sustainable technologies for energy conversion, storage, and saving. Nanotechnology, especially utilizing nanocoatings and nanoparticles, is a suitable tool to develop novel materials for energy-related applications. We designed a unique pilot-scale nanoparticle synthesis plant enabling complementary synthesis routes to produce highly-specific nanomaterials. Depending on precursor and gas-phase composition, materials like metals, metal oxides, or semiconductors are generated. Moreover, the chemical composition of the nanoparticles can be adjusted to produce pure as well as doped, mixed, and composite materials. The reactors enable the synthesis of significant amounts of nanoparticles up to kg/h. Therefore, we are able to produce sufficient amounts of nanoparticulate materials to support materials research toward future energy applications.

Session 5

Fabrication of Nanoporous Cellulose Aerogel Fibres for Fuel Saving in Hybrid Diesel Engines

Dr. Gunnar Seide, ITA, RWTH Aachen

In the hybrid mode of diesel engines the full fuel saving potential is not exploited yet. Preliminary work has shown that elevated fuel temperatures have a significant effect on the fuel consumption within the New European Driving Cycle (NEDC). A thermal encapsulation of the engine leads to reduced cooling and fuel savings could be increased in hybrid mode of diesel engines. Aerogels are one of the most promising high-performance insulation materials considered today. Aerogels are dried gels with a very high porosity and are traditionally synthesized by low-temperature sol–gel chemistry and are essentially dried by supercritical or freeze drying. As a result, dried gels keep the porous structure of the wet stage. Therefore, aerogels have a high specific surface area and an extreme low thermal conductivity of up to 13 mW / (mK). Compared to conventional used materials they show remarkable thermal insulation properties. A scaleable wet spinning process has been developed to continuously produce Cellulose Aerogel fibres. Therefore cellulose is solved in aqueous zinc chloride to form a gel-like spinning dope. The gel is extruded through nozzles into a coagulation bath where the zinc chloride is washed away and the fibres solidify. Afterwards the fibres are dried supercritical with the use of CO_2 to receive Cellulose Aerogel Fibres with a pore system in nano size. These fibres will be used to design an engine encapsulation to further reduce the amount of needed fuel and therefore decreasing the amount of exhausts released into the environment.

Session 5

20 years "naked in the wind" – with high-tech to world leadership

Dr. Thomas Fries, FRT GmbH, Bergisch Gladbach

Mechanical engineering is a capital intensive field of business and characterised by long product development cycles and a tough international competition. This is particularly true with respect to micro and nanotechnologies. But this is not exactly what venture capitalists are looking for. Certainly, it would be much easier if NRW had the technological infrastructure of Silicon Valley, the founder milieu of Berlin, a real VC scene, an entrepreneurially thinking banking culture as well as the innovative drive of Asia.

However, the business is sustainable and based on trust, which has many advantages. It has a lot of "content" and therefore cannot be simply copied. For those who are patient enough and make it in the end it is really not that bad situation. But ONLY IF they make it ... We do it regardless!

Session 6

Innovative sales strategies – How does the Micronit product line find its customers?

Dominique Bouwes, Business Director Micronit GmbH, Dortmund

Dominique Bouwes has completed two courses of microsystems engineering. In 2007 she became the managing director of iX-factory GmbH.

In March of this year iX-factory GmbH merged with Micronit GmbH. Dominique Bouwes is the specialist group leader of the IVAM Microfluidics Group and was a jury member of the innovation prize "Wirtschaft trifft Wissenschaft"

(ZENIT e.V.). Since 2011 Ms. Bouwes has been part of the COSIMA jury (Competition of Students in Microsystems Applications).
In 2015 Ms. Bouwes was elected to participate in the VDI campaign "Engineering Stories". Research and development as well as marketing and sales are the focus of Dominique Bouwes.

Session 6

SmartMembranes GmbH – Strategies for Growth and Internationalization

Monika Lelonek, SmartMembranes GmbH, Halle

Writing a business plan is the first step towards founding a company. But many other aspects should be reviewed and decided upon before starting the business, especially strategies to grow the company such as business and shareholder models and the marketing strategy. SmartMembranes has been founded as a spin-off from a Fraunhofer Research Institute and the University of Halle. Due to the specialized and novel products and services the company can sell in niche markets only. The right marketing strategy and the time to market are fundamental for the growth of the company. International sales have been the main income since the founding in 2009. It is important to find the best sales tools to cover as many countries and areas as possible with a limited stuff and budget. Also many different markets have to be addressed parallelly at limited investments. Within the last years the company has succeeded in penetrating different markets such as the biomedical or the electronics market. The customers are all over the world, mainly in the US/ Canada or Japan and South Korea.
One of the main points for high-tech start-ups is definitively the know-how protection. Depending on the IP situation the right strategy has to be chosen to have a lead over the competitors' products and services.

Session 6

Carbon Nanomembranes, the Other Carbon-Based 2D-Material – Use in Gas Separation and Ultrafiltration

Dr. Albert Schnieders, CNM Technologies GmbH, Bielefeld

Carbon Nanomembranes (CNMs) are one molecular monolayer thin, Carbon-based polymeric films with properties which can be specifically adjusted for a variety of applications. As a Carbon-based 2D-material, CNMs are related to graphene. However, they have many properties, which cannot easily be achieved for graphene. Their surfaces can be chemically or biologically functionalized (even differently on both sides). Perforation can be intrinsically achieved during fabrication. The size distribution and density of pores can thereby be controlled. Additionally, it is possible to convert CNMs into graphene. A scaling of production to any wanted size is principally possible. Recently, we manufactured in a laboratory set-up the first large-size CNMs (approx. 20 x 30 cm²). Based on these experiments, we designed a batch-based production of CNMs with a capacity of several 10,000 m² per year. Possible applications of these "ballistic" membranes will be discussed in this presentation.

Session 6

From University to Business: Start-up Funding in NRW

Dr. Hendrik Vollrath, Projektträger Jülich

Knowledge and technology transfer are very important for science and the economy in NRW. Until 2020, the Ministry of Innovation, Higher Education and Research of North Rhine-Westphalia provides a total funding of 21 million euros. This funding allows graduates and employees from North Rhine-Westphalian universities to develop product ideas, optimize their business concept and to prepare a business launch.
Project proposals can be submitted twice a year. Each proposal receives up to € 240,000 for up to 18 months. Usually, the funding rate is 90%.
The presentation describes funding conditions, gives advice for successful applications and presents examples for earlier start-up projects.

Session 6

Nanobay – From the Idea to the Market Launch

Prof. Dr. Gregor Luthe, Nanobay - NB GmbH, Gronau

While the whole world talks about nanotechnology, it is sometimes difficult to establish a market presence or to identify new business opportunities. Companies, especially start-ups and SMEs, need easy market access with prospects for expansion and diversifications. I was on the quest for the missing link between advances in research and the commercial success of nanotechnology. Tokyo 2016 was our launch, on the biggest exhibition in nanotechnology worldwide. Currently, we are restructuring our site based on the wishes of our customers.The founder will share his personal experience and transformations from professor to science manager with you.

Session 6

nanobay

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- Hilfe zur Markterschließung

Auftragserfindung

- Vermittlung von Auftragsforschung
- Hilfestellung bei der Prototypentwicklung

News

- Aktuelle Nano-News
- Forschungsergebnisse und Entwicklungen
- Produktneuheiten
- Brancheninterviews

Investitionen

- Nanobay Techfund: Finanzielle Beteiligung an Start-ups und Innovatoren
- "Golden-Egg-Check"

Konferenzen

- Umfassender Kalender zu Branchen-Messen, Konferenzen und Events weltweit
- Repräsentation vor Ort

Patente

- Beratung, Bewertung, Partner-Vermittlung und Marktplatz für Patente

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Poster Exhibition with Best Poster Award

For the first time the NRW Nano-Conference offers a dedicated Poster Session addressing in particular the young academic community. Young scientists will have the opportunity to present their latest research, share their ideas, network with each other and potentially meet their prospective employer. Out of more than 100 posters the three best presentations will be identified by a jury of experts.

The Best Poster Award facilitated by the Young Academics Sponsorship will be passed on to the winners by a representative of the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia.

The Poster Exhibition is located in the White Room and its foyer and is accessible all time. The Poster Session is scheduled for first conference day at 05:30 pm. Take a look!

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Center for Nanointegration Duisburg-Essen (CENIDE)

CENIDE represents the community of nano-researchers at the University of Duisburg-Essen (UDE); it is one of Germany's largest research networks for nanosciences. From basic research to production and processing of functional nanomaterials: the know-how of more than 65 working groups from the natural, engineering and medical sciences meet here.

The DFG Core Facility ICAN allows for analyzing materials and their properties by using high-resolution microscopy techniques. Amongst others, CENIDE cooperates with the Institute of Energy and Environmental Technology (IUTA e. V.), one of the largest institutes of its kind.

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Center for Nanotechnology (CeNTech)

With the aim to improve the utilization of the vast potential and multifaceted prospects of nano technological research, CeNTech was created in Münster. CeNTech provides academic researchers and companies with 3.600 square metres an ideal environment to direct selected ideas and results of nano-technological research into technical applications. Research and development focuses at CeNTech on the nanoscale analysis, nanomedicine and nanomaterials. CeNTech is offering a fertile platform for interdisciplinary exchange between scientific excellence and business.

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COPT (Center for Organic Production Technology) Cologne University

COPT Center, a part of the Cologne University, is the central institute for Organic Electronics in North Rhine-Westfalia. It is located at the interface between science and business. The Mission of COPT Center is to implement production technologies for Organic Electronics jointly with partners. Combining academic know-how developed at the University of Cologne and professional know-how of partners we help our partners to create a tangible business.

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Forschungszentrum Jülich GmbH Helmholtz-Institut Münster (HI MS)

The Helmholtz-Institute Münster (HI MS) with the official title "Ionics in Energy Storage“ was founded in the year 2014 with the aim to further scientific research in electrochemical energy storage systems. Research efforts are focused on the electrolyte, the component at the center of the battery determining the chemical processes inside the battery. The institute consolidates competencies in battery research of Westfälische Wilhelms-Universität Münster, of Forschungszentrum Jülich and of Rheinisch-Westfälische Technische Hochschule Aachen and is managed by Forschungszentrum Jülich.

booth 20

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Fraunhofer Institute for Laser Technology ILT

With more than 415 employees and more than 19,500 m² net floor space the Fraunhofer Institute for Laser Technology ILT is worldwide one of the most important development and contract research institutes of its specific field. The activities cover a wide range of areas such as the development of new laser beam sources and components, precise laser based metrology, testing technology and industrial laser processes. This includes laser cutting, caving, drilling, welding and soldering as well as surface treatment, micro processing and rapid manufacturing.

booth 15

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Gesellschaft für Bioanalytik Münster e. V

Bioanalytik-muenster is a regional network of universities, research centres, enterprises, transfer institutions, and investors which have joined forces to develop the Münster region into a leading bioanalytics location with the emphasis on nano-bioanalytics. The purpose of the organisation is to promote science, research and education in the field of bioanalytics in the Münster region. Bioanalytik-muenster represents the Münster region in projects and initiatives at national and international level.

booth 28

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Hessen Trade & Invest GmbH

Hessen Trade & Invest (HTAI) is the economic development company for the State. Our central task is to position and strengthen Hessen as an economic and technology site nationally and internationally. Together with representatives from industry, science and government, we work as a catalyst to develop Hessen further. Within HTAI, Hessen-Nanotech coordinates the Hessian activities regarding materials and nanotechnology enterprises.
It is the platform for information, communication and cooperation in materials and nanotechnology and adjacent areas like micro systems technology or photonics.

booth 25

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Hitachi High-Technologies Europe GmbH

Hitachi High-Technologies Co., a leading supplier of electron microscopes and scientific instrument solutions, is a global company that is moreover engaged in a broad range of fields, including electronic device systems, life sciences, information systems & electronic components and advanced industrial products. Hitachi High-Technologies is a subsidiary of Hitachi Ltd. founded in 1947, the Headquarter is located in Tokyo and operates 20 offices in Japan and 60 offices in twenty-three countries, with over 10,000 employees worldwide. Since the 1970's Hitachi electron microscopes have been distributed by the European headquarter located in Düsseldorf. In 2002 Hitachi High-Technologies Europe GmbH moved into a new building in Krefeld Fichtenhain with offices for 113 employees, a clean room and demo rooms for atomic force microscopes, scanning and transmission electron microscopes as well as focused and broad ion beam systems for sample preparation and failure analysis.

booth 19

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ION-TOF GmbH

IONTOF is a manufacturer of innovative instruments for surface analysis with different product lines for time-of-flight secondary ion mass spectrometry (TOF-SIMS) and high-sensitivity low-energy ion scattering (LEIS).
Since the technique became commercially viable ION-TOF has made many product improvements and more than 300 instruments are in operation in industrial and academic laboratories worldwide.

booth 14

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LeitmarktAgentur.NRW Projektträger Jülich

As a core element of the current funding period of the OP ERDF NRW 2014-2020 "Investments in Growth and Employment", competitive calls in 8 lead markets are being promoted.
The regional government of NRW has assigned the LeitmarktAgentur.NRW, headquartered at FZ Jülich, to organise these lead market competitions.
The task of the LeitmarktAgentur.NRW encompasses the entire spectrum of project funding, i.e. it designs the competitive calls in tight co-operation with the respective ministries, advises participants, approves and supports projects recommended for funding up to their conclusion. **booth 03**

booth 03

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MEET (Münster Electrochemical Energy Technology) at Münster University

MEET - Batterieforschungszentrum
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MEET (Münster Electrochemical Energy Technology) is the battery research center at Münster University. As an innovative research center, it brings together basic scientific research and industrial applications at one location.
MEET cooperates closely with scientific institutions and partners from industry including small and medium-sized businesses. The state-of-the-art laboratory infrastructure enables MEET to work on functional material synthesis, electrode and cell production, cell testing and the „BaSiL", a laboratory for improving the safety of battery cells.

booth 20

Micronit GmbH

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Micronit is a key supplier of microfluidic devices to life sciences and chemistry markets worldwide and has been manufacturing microfluidic components for more than 15 years. These products are used in DNA analysis, as medical tests, as components for analytical instrumentation and space technology.

Micronit has extensive experience in micromachining, microfluidics and MEMS and is a dedicated research and development partner for both science and industry.

booth 06

Microtrac GmbH

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Microtrac provides the materials characterization world with innovative, reliable, and repeatable particle size, particle shape, particle charge, and surface area analysis instrumentation.

- Particle Size Measurements from nm to mm, in wet dispersions and dry powders
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Microtrac is notable for its work in the advancement of the heterodyne Reference Beating DLS technology, which allows to measure suspensions of higher mass concentrations than with conventional PCS.

booth 47

Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia

Ministerium für Innovation, Wissenschaft und Forschung des Landes Nordrhein-Westfalen
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Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia

Nano- and Microtechnologies as well as Advanced Materials Sciences are key enabling technologies for modern society. Mastering these technologies means being at the forefront of managing the shift to a low carbon, knowledge-based economy and society. The Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia therefore supports cooperation and networking as well as R&D-projects in these fields.

booth 03

Monasterium Laboratory
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MONASTERIUM LABORATORY
Skin & Hair Research Solutions GmbH

MONASTERIUM Skin & Hair Research Solutions GmbH is a new dermatology start-up company which specialises in the latest and cutting edge research. Under the use of in vitro and ex vivo skin and hair models the company explores the many aspects of dermatological research.

booth 32

Nano3Bio c/o beemo GmbH
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Nano3Bio
c/o beemo GmbH

The EU funded project Nano3Bio is convening researchers from universities and companies in Europe and India, joining forces to make a vision real - developing biotechnological production processes for third-generation chitosans.

Nano3Bio will advance market penetration by producing defined chitosans with closely controlled, tailor-made qualities. Biotech processes using bacteria, yeasts or microalgae will be scaled up. These chitosans have the potential to be the most versatile class of functional biopolymers for multiple application areas like medicine, cosmetics, agriculture and food.

booth 48

nanoAnalytics GmbH

In two divisions nanoAnalytics offers professional analysis solutions to their customers:

We are a laboratory for analytical services in the area of surfaces, interfaces and microscale analysis. For this we make use of SEM/EDX, XPS, TOF-SIMS, AFM or profilometry for example.

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booth 17

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Nanobay - knowledge & trade

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NanoCanada

NanoCanada is a national initiative that brings together the community to stimulate innovation, enhance R&D capacity and stimulate the development of nanotechnology applications in collaboration with industry.

booth 37

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Nanotechnology Alliance NRW e.V.

The Nanotechnology Alliance NRW e.V. is an interdisciplinary group of researchers, developers and university teachers from the state of North Rhine-Westphalia in Germany to promote thepractical application of nanotechnology.
Since 2001, the communication platform brought together interested parties from academia, industry and society to exchange views and k nowledge on nanotechnologies and perform collaborative research and teaching projects.

booth 45

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Netzwerk Innovative Werkstoffe Rheinland
Rheinisch-Bergische Wirtschaftsförderungsgesellschaft mbH

The “network Innovative materials Rhineland“ provides partners along the entire value chain all the benefits of early cooperation. The network offers contacts to external companies, research institutions, municipalities, government and government agencies. Involved are economic development agencies of the cities of Leverkusen, Krefeld, Dormagen and the economic development agencies of the Rhine district Neuss and Rhein Berg District.

booth 24

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Today Nikon is a world-renowned brand, firmly established as a market leader in optical instrumentation and the only microscope company to manufacture its own glass.

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NINa - The North German Initiative Nanotechnology Schleswig-Holstein e.V

The North German Initiative Nanotechnology Schleswig-Holstein e.V., short NINa SH e.V., is a registered society aiming at the advancement of science and research in the field of nanotechnology in Schleswig-Holstein (Germany).
NINa's mission is to interlink parties from Schleswig-Holstein involved in nanotechnology with relevant stakeholders from all across northern Germany and the Baltic region states.

booth 36

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The Interreg project NMP-REG (Delivering Nanotechnologies, new Materials and Production to Regional Manufacturing)

The Interreg project NMP-REG (Delivering Nanotechnologies, new Materials and Production to Regional Manufacturing) aims at fostering the transfer of the key enabling technologies NMP to regional industrial manufacturing. Based on a regional analysis of applied innovation strategies, needs and Good Practices, the project will draft policy recommendations and develop action plans to be implemented in the later project stage.

NMP-REG started on 1st April 2016 and has a duration of 5 years.
The partnership consists of 7 partners from 5 EU Member States.
Lead partner is ASEV from Tuscany, Italy.

booth 42

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NanoMicroMaterialsPhotonics.NRW Cluster

The cluster NMWP.NRW (german: NanoMikroWerkstoffePhotonik) was founded in 2009 by the government of North Rhine-Westphalia in order to make NRW the most competitive and dynamic knowledge-based economic area in the field of the four key enabling technologies nano-, micro-and photonic technologies as well as in the field of new materials.

The cluster is the central point of contact for economical, scientific and political affairs in respect of the fields of the four technologies. It represents the interests of the companies and institutes and builds a well-functioning network for NRW-actors. Furthermore the cluster consults the NRW-actors in strategy- and marketing affairs and organizes exhibitions, workshops and other events to foster national and international cooperations.

booth 04

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NanoMicroMaterialsPhotonics e.V.

The association NanoMicroMaterialsPhotonics e.V. was initiated in April 2012 by North Rhine-Westphalia's NanoMicroMaterialsPhotonics.NRW Cluster as well as some companies and research institutions. The association promotes Nanotechnology, Microsystems, Materials and Photonics

The association serves as a platform for an intense exchange between industry, politics and research. It observes new trends and perspectives and develops means for an active support of the members' projects. It supports academic and professional education and it offers counselling in the area of public funding.

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booth 04

Optence e.V.

Kompetenznetz Optische Technologien Hessen/Rheinland-Pfalz

Optence e.V. is a platform for knowledge-transfer. It develops contacts between optics companies and research institutions, initiates working groups and expert meetings and organizes joint exhibition booths at national and international trade shows.
The member structure of Optence e.V. covers the entire value chain of optical technologies: raw material suppliers, optical componenten manufacturers, system producers, designers, finishers and product users as well as numerous research organizations and university institutes.

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booth 50

Particle Metrix GmbH

The expertise of Particle Metrix is the development, production and distribution of particle measurement systems. The analysers are made for particle size and zeta potential measurement, which are divided into the product lines „colloid analysis“ and „Life Science“. In the colloidal part the main interest is about size and stability measurements of macromolecular solutions, emulsions and dispersions, while the life science sector includes analysis of extracellular vesicles (exosomes), protein aggregation and clinical diagnostics. Here the interest is focused on the size and concentration determination as well as the zeta potential measurement.

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booth 30

Particular GmbH

Nanoparticles are our business: Particular GmbH produces purest nanoparticles from almost any solid material dispersed in water or organic solvents.
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Physical Electronics GmbH

The Physical Electronics GmbH is a stable partner for high-tech companies located in Munich, Germany, more than 21 years. Our core values are market-oriented approach, continuous improvement and excellent customer support. The Marketing of innovative ideas and the sale & service of fascinating products is our daily business. Areas of our expertise are in AFM-IR, an innovative combination of sub 50nm high spatial resolution IR Spectrometry and AFM microscopy, Surface Science and Nanomechanical Testing.
Providing the highest possible level of After Sales Support for our customers, we have established a very effective service organization able to meet the requirements of Industry, Institutes and Universities.

booth 46

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www.phi-gmbh.eu

ProH+ GmbH

ProH+ is a spin-off company of the University of Applied Sciences Gelsenkirchen. The main focus is on marketing research results in the field of hydrogen technology worked out in cooperation with the Westphalian Energy Institute. ProH+ develops fuel cell and electrolyzer systems, especially, for niche applications. In particular, ProH+ offers test equipment for fuel cell and electrolyzer components.

We offer:
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- Development of PEM fuel cell systems
- Development of PEM electrolyzer systems
- Automation and controls for hydrogen energy systems

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Raith GmbH

Raith GmbH
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Founded in 1980 and headquartered in Dortmund, Germany, Raith is a leading precision technology solution provider for nanofabrication, electron beam lithography, focused ion beam fabrication, nanoengineering and reverse engineering applications.
Raith Customers are involved in various fields of nanotechnology research and materials science – as well as industrial and medium sized enterprises that use nanotechnology for specific product applications or produce compound semiconductors. The company works as closely as possible with customers in the most important global markets, through subsidiaries in the Netherlands, the USA, and Asia and through an extensive partner and service network.

booth 10

ROCKET (Regional Collaboration on Key Enabling Technologies) INTERREG VA-Program

ROCKET INTERREG V A
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Rocket fosters cross-border cooperation between business and science in the German-Dutch border region between North Sea and Lower Rhine t o strengthen research, technological development and innovation.

Key enabling technologies (such as nanotechnology, microsystem technology, micro- and nanoelectronics, innovative materials as well as photonics) form the technological basis for the answers to the global challenges.

This project is part of the INTERREG programme and thus financially supported by the European Union and INTERREG partners.

booth 39

Saxion University of Applied Sciences

Department of Nanotechnology
School of Life Science, Engineering & Design (LED)

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The Nanotechnology research groups at Saxion have three main goals:
1) Offer an outstanding interdisciplinary and internationally oriented BSc and MSc study programme;
2) Initiate and execute applied research with small and medium sized enterprises (SMEs), industry and other societal partners in the field of micro- and nanotechnology;
3) Support start-ups and SMEs with equipment and organization.

In September this year the first Master Programme in Applied Nanotechnology (2 years) started at Saxion.

booth 31

SGS INSTITUT FRESENIUS GmbH

SGS, headquartered in Geneva, is the world's leading inspection, verification, testing and certification company. The range of services comprises the inspection and testing service of raw materials, products and services, as well as the certification service according to international norms and standards. More than 85,000 employees around the globe offer customers a seamless service in nearly all industries. SGS has been operating in Germany since 1920, and today has a workforce of 3,000 employees at 40 locations. The companies' headquarter is located in Hamburg.

booth 08

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Smart Membranes GmbH

SmartMembranes was founded by Dr. Petra Goering und Monika Lelonek in Halle (Saale) on 20th July 2009 as a spin-off from the Fraunhofer Institute for Mechanics of Materials. The company is the leading manufacturer of high-ordered porous materials from alumina and silicon with defined and adjustable membrane properties and structure parameters. SmartMembranes manufactures not only membranes on customers' request, they also develop new processes and products around the core business.

booth 43

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TechnologieZentrumDortmund Management GmbH

Competence Center for Micro and Nanotechnology.
At the MST.factory dortmund new businesses are not only offered start-up assistance, they also benefit from a technical and collaborative environment, in wich they can more easily transform their projects into commercial success.

booth 11

TechnologieZentrumDortmund
Management GmbH
MST.factory dortmund
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temicon GmbH
micronano solutions

temicon GmbH is the leading producer of high-quality micro- and nanostructured products serving as key components for applications like lighting, display, life science, solar technology and environmental engineering. The young and growing technology enterprise has established a unique technology platform for micro- and nanostructure technology aspects. The company uses lithographic processes, thin-film technologies, electroforming, injection molding, R2R- and R2P-technologies for the production of micro- and nanostructures – with special focus on large size patterning.

booth 12

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Universität Siegen
“School of Science and Technology”

The key benefit of the “School of Science and Technology”, located at the University of Siegen, is its interdisciplinary oriented research profile. Two domains, namely material science and sensor technologies including sensor data processing, establish a basis for multidisciplinarity among the different research fields. Research at the School of Science and Technology addresses not only questions of technical fundamentals but also develops solutions for industrial applications. Topics like Cyber-Physical Systems and Interfaces gain more and more importance as they combine current social needs as a result of e.g. the demographic change (smart mobility) with novel and innovative sensor technologies.

booth 21

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WESSLING GmbH
Funktionale Materialien- Mikro- und Nanoanalytik

WESSLING is with more than 1200 employees one of Europe’s leading companies for analysis, certifying and consultancy. In the field of micro- and nano-analytics WESSLING provides various analytical and consultant services. Analytical techniques are used to characterize materials, chemically and physically, as well as anti-microbiological activity of materials. Moreover WESSLING addresses the topic „Health & Safety“ and provides i.a. on-site measurements of airborne particles.

booth 13

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Wirtschaftsförderung Dortmund

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Wirtschaftsförderung Dortmund
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booth 09

Wirtschaftsförderung Münster GmbH

The core business of the Wirtschaftsförderung Münster GmbH (WFM) is the commercial development and marketing of industrial real estate, the approval management, real estate services, the foundation and funding consultance, location marketing and public relations. The WFM is connected to citywide networks of all major institutions and actors in Münster as well as to the right contact persons. The WFM makes investors curious about Münster and binds the investments of new and existing companies to the Münster region.

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booth 01

WITec GmbH

WITec is a leading German manufacturer of confocal and scanning-probe microscopes for state-of-the-art Raman, Atomic Force Microscopy (AFM), Scanning Near-Field Optical Microscopy (SNOM) and developed the integrated Raman Imaging and Scanning Electron (RISE) microscopy. WITec has been distinguished by its innovative product portfolio and a microscope design that enables combinations of the various imaging techniques within one system. An exemplar of the company's breakthrough development is the world's first integrated Raman-AFM microscope.

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booth 44

Zentrum für BrennstoffzellenTechnik GmbH

ZBT is an independent, industry-oriented research organization and presents ts expertise around production and processing of highly filled thermoplastic polymers with multifunctional properties. The portfolio ranges from electrical and thermal conductive compounds for fuel cells & battery stacks, heat-exchanger or heat-sink applications. Therefore graphite and nanoparticles like carbon black or CNTs are incorporated into various polymers. Furthermore these compounds are corrosion resistant and processible by means of extrusion, calandering or injection-moulding.

booth 35

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ZENIT GmbH / NRW.Europa

Under the name of NRW.Europa, ZENIT GmbH and the NRW.BANK are together offering the best possible support in the area of transnational European business. Our service package encompasses comprehensive advice, for example for internationalisation and innovation projects, in the search for national and international business partners as well as in applications for public funding. Our services are available to enterprises, organisations close to the business and research communities, as well as universities in North Rhine-Westphalia. Our top priority is small and medium-sized enterprises (SMEs).

booth 38

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Zoz Group

The core-competences of Zoz Group cover equipment manufacturing for mechanical process engineering particularly for the manufacturing of Nanostructured Materials as well as materials design from powder, layers and bulk parts to magnetic filters, batteries, hydrogen-drives with H2 solid state absorber tanks incl. vehicles.
Affiliated companies serve E- and E-H2-mobility, maintain buildings and operate student's dormitories, a tour operator as well as sailing and aircraft operations.

booth 05

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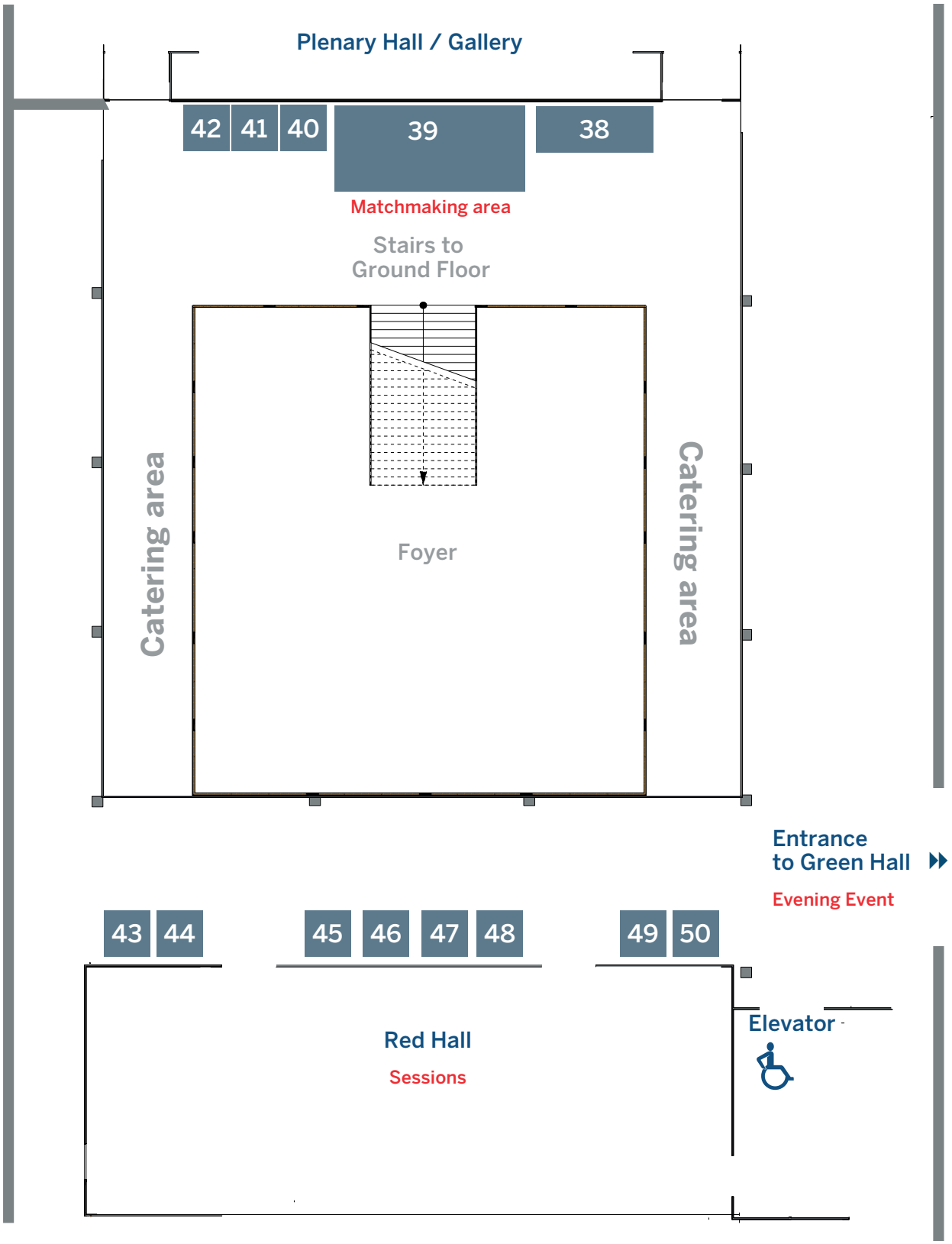
Plan Ground Floor

Plan 1st Floor



Business Pitches

The Business Pitches take place in the Blue Room on the Ground Floor.

	7th December 2016	8th December 2016
01:30 - 01:34 pm	NanoAnalytics GmbH	Fraunhofer Institut für Lasertechnik ILT
01:35 - 01:39 pm	NanoCanada	Zoz Group
01:40 - 01:44 pm	Microtrac GmbH	Hitachi High-Technologies Europe GmbH Electron Microscopy
01:45 - 01:49 pm	Center for Nanotechnology CeNTech/ EVORION Biotechnologies	NanoCanada
01:50 - 01:54 pm	Raith GmbH Nanofabrication	ION-TOF GmbH
01:55 - 01:59 pm	CNM Technologies	ProH+ GmbH
02:00 - 02:04 pm	temicon GmbH	Micronit GmbH
02:05 - 02:09 pm	Wessling GmbH Funktionale Materialien- Mikro- und Nanoanalytik	Particular GmbH
02:10 - 02:14 pm	Physical Electronics GmbH	Netzwerk Innovative Werkstoffe Rheinland Rheinisch-Bergische Wirtschaftsförderungs-gesellschaft mbH

06:00 - 06:04 pm	Zentrum für BrennstoffzellenTechnik ZBT GmbH
06:05 - 06:09 pm	Nano3Bio c/o beemo GmbH
06:10 - 06:14 pm	Universität zu Köln. COPT (Center for Organic Production Technology)
06:15 - 06:19 pm	Particle Metrix GmbH
06:20 - 06:24 pm	MONASTERIUM LABORATORY Skin & Hair Research Solutions GmbH
06:25 - 06:29 pm	SGS INSTITUT FRESENIUS GmbH

Nano4School powered by MExLab Physik

This year, the NRW Nano-Conference offers inspiration about the vital subjects of science and technology even for our youngest talents. The MExLab experimental physics demonstration laboratory of the University of Münster offers school classes to explore the basic principles of scanning probe microscopy (SPM) using a device built out of LEGO® bricks.

Münsters Experimentierlabor Physik (MExLab Physik) is a hands-on science lab for pupils located on the scientific mathematical campus of the University of Münster. Its aim is to foster long-lasting interest in the subject field of science, technology, engineering and mathematics (STEM), primarily in physics, for secondary-school pupils.

Therefore, MExLab Physik offers a wide range of target group appropriate experiment-based workshops with up to date scientific topics, e.g. nanosciences. MExLab Physik also runs a unique hands-on exhibition with variety of interactive experimental displays.

The MExLab Physik is located in the foyer of the Blue Room on the Ground floor.

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MEET - Batterieforschungszentrum der Universität Münster

24IP LAW GROUP - SONNENBERG FORTMANN

Media partners

GDCh Gesellschaft Deutscher Chemiker

Cluster Nanotechnologie

deutscher verband nanotechnologie

NANORA Nano Regions Alliance

EnergieAgentur.NRW

NINa Norddeutsche Initiative Nanotechnologie

Werkstoffe in der Fertigung

Innovative Medizin.NRW Cluster Nordrhein-Westfalen

ZENIT

Notes

The Advisory Board

In January 2016 the Advisory Board for the 7th NRW Nano-Conference was set up. It consists of senior representatives from business, science and society and decides on topics and programme points of the Conference.

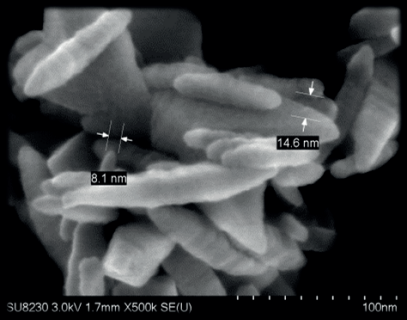
Dr. Lutz Aschke, Trumpf Lasertechnik AG | **Dr. Gerd Bachmann**, VDI-TZ Consulting | **Dr. Michael Bäcker**, Deutsche Nanoschicht GmbH | **Prof. Dr.-Ing. Stephan Barcikowski**, Universität Duisburg-Essen | **Prof. Dr. Manfred Bayer**, Technische Universität Dortmund | **Dr. Michael Berkei**, BYK-Chemie GmbH | **Prof. Dr. Görge Deerberg**, Fraunhofer UMSICHT | **Prof. Dr. Cornelia Denz**, Westfälische Wilhelms-Universität Münster | **Dr. Astrid Epp**, Bundesinstitut für Risikobewertung | **Dr. Johannes Fink**, 3M Deutschland GmbH | **Prof. Dr. Ellen Fritsche**, Heinrich-Heine-Universität Düsseldorf | **Prof. Dr. Armin Gölzhäuser**, Universität Bielefeld | **Prof. Detlev Grützmacher**, Forschungszentrum Jülich | **Dr. Birgit Hagenhoff**, tascon GmbH | **Prof. Dr.-Ing. Klaus Kallis**, Technische Universität Dortmund | **Dr. Péter Krüger**, Covestro Deutschland AG | **Prof. Dr. Thomas Kuhlbusch**, Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. | **Prof. Dr. Max Lemme**, Universität Siegen | **Prof. Dr. Peter Loosen**, Fraunhofer Institut für Lasertechnik | **Prof. Dr. Klaus Meerholz**, Universität zu Köln | **Dr. Arno Nennemann**, Huntsman Pigments and Additives | **Prof. Dr. Bart Jan Ravoo**, Westfälische Wilhelms-Universität Münster | **Andrea E. Reinhardt**, nanofutures a.s.b.l. lighthouse Germany | **Prof. Dr. Ullrich Scherf**, Bergische Universität Wuppertal | **Dr. Jürgen Schnekenburger**, Westfälische Wilhelms-Universität Münster | **Prof. Dr. Albert Sickmann**, Leibniz-Institut für Analytische Wissenschaft Dortmund | **Prof. Dr. Henning Zoz**, Zoz Group

Notes

Notes

Hitachi SU8200

with next-generation CFE:
the perfect fusion of
observation & analysis



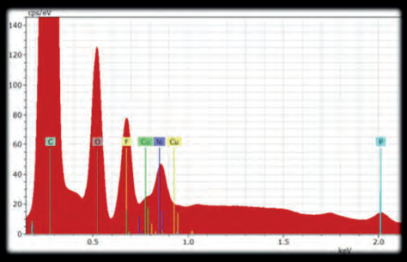
Diameter and surface of TiO_2 nanoparticles

Resolve.

Hitachi's revolutionary next-generation CFE gun combines the smallest & brightest source with narrow energy spread and incredible probe current stability – a highly coherent source in every respect.
The result? Incredible resolution from just 10eV.

Detect.

Two in-lens Super ExB detectors with SE/BSE energy filtering show it all, even at extremely low voltages.
Options for BF/DF-STEM and multi-segment BSE complete the most flexible and sensitive detection system available.



LiB: 3kV EDX spectrum of the cathode material detecting C, O, F, Co, Ni, Cu and P with 170kcps

Analyse.

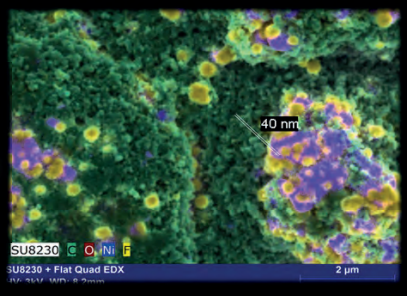
Need to analyse sensitive and nanoscaled materials?
Hitachi's novel CFE gun provides long-term stability and high probe current at all voltages – making high spatial resolution x-ray microanalysis and EBSD routine.

Sign in for a LIVE demo at our booth !

Understand.

Hitachi's SU8200 provides more information, more quickly and more easily than ever before - for deeper sample understanding.

Next-generation CFE – for high performance imaging & analysis.



LiB: 3kV EDX mapping of C, O, Ni and F with a lateral resolution of 40nm (Aquis. time: 7min)

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Inspire the Next

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