NMWP.NRW
Cluster NanoMicroMaterialsPhotonics

City of Dortmund
Economic Development
Agency

8th NRW Nano Conference

Innovations in Materials and Applications

21 - 22 November 2018, The Dortmund Congress Centre

Ministry of Economic Affairs,
Innovation, Digitalization and Energy of the
State of North Rhine-Westphalia

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www.nanoconference.de

Cluster Manager
Dr.-Ing. Harald Cremer

CONTENTS

Greetings

Dear Ladies and Gentlemen,

Being worldwide present on the leading markets with viable products is of highest priority for the economically strong State of North Rhine-Westphalia.

Nanotechnology as well as innovations in materials and applications, the two focal topics of the conference, together with other key enabling technologies, form the basis for the economic strength of the industrial state of North Rhine-Westphalia. The exchange of knowledge and experience as well as the networking of North Rhine-Westphalian actors play a decisive role in this. The 8th NRW Nano Conference offers an excellent opportunity for this purpose.

The conference's scope covers a broad range of application domains. These are being complemented by two additional tracks with reports on successful, innovative R&D projects funded within previous NRW lead market competitive calls and project presentations on cross-border innovations in key enabling technologies from the INTERREG V A project ROCKET. Another highlight is the "Start-up Session", which aims at motivating particularly young academics to trigger their entrepreneurial spirit for a high-tech start-up.

The NRW Nano Conference as Germany's premier event in the field of key enabling technologies and their applications attracts outstanding, world-renowned experts from multidisciplinary research as plenary and keynote speakers: Prof. Dr. Tommaso Calarco presents the European Commission's FET Flagship on Quantum Technologies and highlights the importance and economic opportunities of quantum technologies for Europe, Germany and particularly North Rhine-Westphalia. Keynote speeches by Prof. Dr.-Ing. Nathalie Katsonis, Prof. Adrian M. Ionescu, Ph.D., and Dr. Jaap Haartsen give insights into current developments and technologies in their respective field of research.

I wish the 8th NRW Nano Conference every success and all participants an exciting exchange of knowledge and experience as well as informative conference days.

Prof. Dr. Andreas Pinkwart
Minister for Economic Affairs, Innovation, Digitalization and Energy
of the State of North Rhine-Westphalia

Dear Ladies and Gentlemen,

North Rhine-Westphalia is a strong region with excellent scientific research and outstanding economic growth prospects in the field of nano- technologies. For this reason, I am very pleased that the state of North Rhine-Westphalia has decided to continue to promote this field of technology and to hold the 8th NRW Nano-Conference in Dortmund – to which I cordially invite you.

As part of the network meeting, over 700 experts from science, business and politics will meet over two days to advance research and application of this key technology. In addition to invited top-class international speakers, seven exciting topics offer the latest technological developments and show opportunities, potentials and trends of nanotechnology as well as innovations in materials and applications.

Dortmund has developed into a technology and science location and is today one of Europe's leading clusters of micro- and nanotechnology. Already more than 40 companies with around 3,000 employees work in micro- and nanotechnology – with an upward trend! Numerous world market leaders and specialist suppliers form the basis of this success.

I wish all participants interesting discussions and a successful conference!

Thomas Westphal
CEO Economic Development Agency Dortmund

Dear Ladies and Gentlemen,

In the last decade the fusion of nanotechnology and materials science proved to be of mutual benefit for both disciplines. North Rhine-Westphalia as Europe's economic powerhouse is home to an excellent academia and global players in production and manufacturing technologies turning this federal state into the leading region in nanotechnology and materials in Europe. Therefore, for the first time in its history, the programme of the 8th NRW Nano Conference comprises sessions from several application domains of nanotechonology and moreover focuses on innovations in materials and their applications.

To meet the challenges of this broadened scope of the conference, the 8th NRW Nano Conference now consists of up to four parallel sessions and therefore more than 100 lectures, talks and pitches. As a complete novelty, the conference dedicates two sessions to project presentations on successful R&D projects stemming from the NRW lead market competitive calls and the INTERREG V A project ROCKET. Additionally, the conference includes well-known successful conference modules like the Exhibition with more than 55 exhibitors and the Poster Exhibition with almost 120 posters.

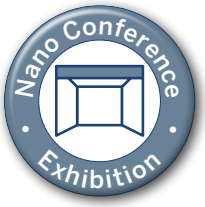
I am quite confident that such a comprehensive and varied programme will convince you to attend the 8th NRW Nano Conference. I wish all participants inspiring lectures, exciting discussions and stimulating conversations. We look forward to welcoming you in Dortmund.

Dr.-Ing. Harald Cremer
Cluster Manager NanoMicroMaterialsPhotonics.NRW

Elements of the 8th NRW Nano Conference

Sessions

The core element of the NRW Nano Conference is the scientific programme. A plenary talk, keynote speeches, technical lectures from the Call for Presentations as well as scientific posters from the Call for Posters make up this highlight of the conference.
For the first time in its history, the conference focuses not only on nanotechnologies but on innovations in materials and applications and this, a novelty as well, in four parallel sessions!



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 bestowed to the three best exhibitors at the Networking Event on the evening of the first conference day.

Poster Exhibition with Best Poster Award

A selection of nearly 120 posters will be presented to accompany the NRW Nano Conference. Within the framework of the Young Academics Programme sponsored by Covestro Deutschland AG, the three best posters are assessed by an expert jury from the Advisory Board. The winners are honored during the Award Ceremony on the second conference day.

Young Academics with Start-up Session

The Poster Exhibition offers especially Young Academics the opportunity to present their research ideas, projects and insights to the international visitors from science and industry.
Young Academics with an accepted poster or oral contribution benefit from reduced registration fees.
Directed mainly at all Young Academics, the Start-up Session will give tailor-made advice and best practice examples on how to start a company successfully based on a business idea from the field of key enabling technologies.

Business Pitches

Exhibitors present themselves in a 240 second talk. The business pitches take place during he lunch breaks and prior to the Networking Event on the evening of the first day.

NEW! Project Sessions

For the first time, the Nano Conference devotes special sessions to successful R&D projects stemming from the NRW lead market competetive calls and the INTERREG V A project ROCKET. Project presentations give an insight into consortia, research and (first) results.

Business Matchmaking

Networking of all actors from key enabling technologies along the complete value chains is one of the core goals of the NRW Nano Conference. In order to pave the way for successful networking with other conference participants with whom you share for instance common research project ideas but are so far unfamiliar to you, the Business Matchmaking tool allows for individually scheduled meetings for networking and exchange.

By registering for the conference, your personal Matchmaking Profile will be generated automatically. As soon as you have completed your profile – providing more information about what you are looking for, what you offer and possibly about the company you are representing – other conference participants can find you as their match.
Starting on 22 September appointments can be made.

Participating in the Matchmaking Event of the 8th NRW Nano Conference lets you find new project partners, costumers or employers, maintain old and new contacts or just have interesting discussions.

In order to create optimal conditions for your networking, we have distributed the matchmaking slots over the entire duration of the conference.
At the end of the Matchmaking period you will receive an email listing all your appointments.

Key data for the Business Matchmaking:

Registration period: until 15 November

Matchmaking period: 22 September - 15 November

Matchmaking Sessions:

- 21 November: 12:45 pm - 02:15 pm
- 21 November: 05:45 pm - 06:15 pm
- 22 November: 10:45 am - 11:15 am
- 22 November: 01:20 pm - 02:20 pm

Sessions of the 8th NRW Nano Conference 2018

■ Energy Efficiency

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. Furthermore, lightweight design and nanotechnological innovations in construction industry improve efficient use of energy. This and much more about nanoenergy as well as materials relevant to energy efficiency are focus of this session.

Chair: Dr. Felix Müller, Evonik Industries AG | Dr. Guido Bonati, LIMO GmbH

■ Characterisation & Simulation: Enablers for Nanotechnology and Materials

Characterisation techniques used on nanomaterials and nanostructures allow for understanding the way atoms and molecules are arranged. This knowledge as well as simulation tools for multi-scale materials modelling of the composition and characteristics of a material can be used to assess the value of a material for distinct applications. This session focuses on characterisation and simulation techniques as well as innovations in their theories and backgrounds.

Chair: Dr. Birgit Hagenhoff, tascon GmbH | Prof. Dr. Thomas Kuhlbusch, Federal Institute for Occupational Safety and Health (BAuA)

■ Electronics & Optoelectronics

Information and communication technologies have become a decisive factor for industry and the society as a whole. The continuing process of miniaturisation as described by Moore's Law has come close to its physical limits. New concepts of nanoelectronics 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 and optoelectronics form the basis of this session.

Chair: Prof. Dr. Manfred Bayer, TU Dortmund | Prof. Detlev Grützmacher, Forschungszentrum Jülich | Prof. Dr. Max Lemme, AMO GmbH

■ Health & Medicine

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 in the field of drug design and delivery. Medical technology and medical products offer a wide range of optimised procedures based on nanotechnology to maintain and promote health. Thus, nanomedicine, nanomedical technology and nanohealth are the topics of this session.

Chair: Dr. Holger Winter, CeNTech GmbH

■ Regulations, 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 and regulations of nanotechnology. The results of these projects and societal acceptance are a major research field and thus the basis of this session.

Chair: Prof. Dr. Elke Dopp, University of Duisburg-Essen

NEW SESSIONS IN 2018

■ Functional Surfaces

The functionalisation of surfaces and layers, i.e. the targeted modification of the surface properties to desired functions, allows the deployment of established materials with improved surface properties. Tailor-made surface properties for arbitrary applications can be generated, for example, by nanostructuring, by photonic processes or custom-fit coatings, as some important material properties such as wettability, adhesion, tribological or electro-optical properties and biocompatibility are determined only by the chemistry and topography of the surface.
Such functional surfaces as well as their generation are the focus of this new session.
Dr. Péter Krüger, Covestro Deutschland AG | Monika Lelonek, SmartMembranes GmbH

■ Fibres & Composites

Innovative fiber-based and (composite) materials enable completely new applications. The combination of two or more components generates in total more advantageous properties in the resulting composite material compared to the separate use of individual materials and their components and is at the same time resource-saving, sustainable and efficient.
In particular, size effects, for example by introducing fibers with diameters in the nanometer range, and the geometry of the components play a crucial role in the properties of the composites. The topic of fibers and composites is the content of this novel session.
Chair: Prof. Dr. Jeanette Orlowsky, TU Dortmund University

■ Start-up Session

A short while ago, the State of North Rhine-Westphalia launched a variety of initiatives to significantly increase the number of business formation: To support this endeavor and to motivate especially Young Academics to find their entrepreneurial spirit for a high-tech start-up, the 8th NRW Nano Conference features the Start-up Session.

In this session, founders and representatives from various fields of the supporters' circle will give tailor-made advice and best practice examples based on a business idea from the field of key enabling technologies. The (co-)founders of three start-ups will give insights into their founding phase. These talks will be intermitted by offhand speeches given by representatives from various supporters' circle organisations. They give advice and inside information for the founding process as well as reliable descriptions of problems that can be encountered during the founding phase.
Chair: Dr. Heinz Brückelmann, Cluster NMWP.NRW

NEW SESSIONS IN 2018

■ LEITMARKT.NRW

For the economically strong industrial state of North Rhine-Westphalia (NRW), it is of highest priority to be present in the leading markets worldwide with viable products. These will primarily be products that provide solutions to current global challenges such as demographic change, public healthcare systems, climate and environmental protection, mobility and the knowledge and information society. Sustainable production of goods is the only way to secure and further develop NRW's competitiveness in the global competition for business locations.

The state government has long been focusing on the following eight lead markets according to a policy of „strengthening and developing strengths":
Machine and Plant Construction, Production Technology | Mobility and Logistics | Information and Communication Industry | Energy and Environmental Economy | Media and Creative Industries | Healthcare | Life Science | New Materials.

Funding competitions in all eight lead markets are a very important element in implementing the lead market strategy. In the first competition round in the eight lead markets, more than 800 project outlines were submitted. The LEITMARKT.NRW Session highlights successful project proposals of the first call round from various application fields. The consortium leaders are giving insights into these R&D projects thus reflecting the North Rhine-Westphalian landscape of future and emerging technologies which will spawn innovations based on key enabling technologies.

Chair: Dr. Norbert von Thienen, Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia (MWIDE) | Dr. Ulrich Sydlik, Ministry of Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia (MULNV) | Dr. Christiane Fricke, Ministry of Culture and Science of the State of North Rhine-Westphalia (MKW)

■ Cross-border KET projects – ROCKET

Key Enabling Technologies (KETs) like nanotechnology, are not only local or regional technologies but international technologies addressing global challenges. Transnational co-operations of companies and research institutes accelerate the development of new ideas, products and applications. For this reason, the INTERREG V A project ROCKET („RegiOnal Collaboration on Key Enabling Technologies") has been started to bring together stakeholders in the surrounding of the Dutch-German border. Within this session, different presentations show the results of such successful joint projects and demonstrate the advantages of this cross-border approach. Besides the session, the projects are also engaged in the ROCKET booth within the exhibition.

Chair: Ilka Meisel, Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia (MWIDE)

The ROCKET projects are also presented on booth no. 21.

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Programme at a Glance

	Wednesday, 21st November 2018			
08:30 am	Registration			
09:30 am	Opening of the Exhibition			
10:30 am	Welcome addresses by the organisers Plenary Talk Keynote 1 Keynote 2			
12:40 pm	Lunch Break Exhibition / Poster Exhibition / Business Pitches			
02:30 pm	Energy Efficiency (part 1)	Characterisation & Simulation (part 1)	Start-up Session (part 1)	ROCKET - Cross-border KET projects (part 1)
04:00 pm	Coffee Break Exhibition / Poster Exhibition			
04:30 pm	Energy Efficiency (part 2)	Characterisation & Simulation (part 2)	Start-up Session (part 2)	ROCKET - Cross-border KET projects (part 2)
05:30 pm	Poster Session / Business Pitches / Exhibition (until 06:30 pm)			
07:00 pm	Networking Event with Award Ceremony „Best Exhibitor Award“ at Deutsches Fußballmuseum Dortmund * Pre-Registration was required			
09:30 pm	End of the first conference day			

	Thursday, 22nd November 2018			
09:00 am	Registration			
09:30 am	Electronis & Optoelectronics (part 1)	Health & Medicine (part 1)	Functional Surfaces (part 1)	LEITMARKT.NRW (part 1)
10.40 am	Coffee Break Poster Session / Exhibition			
11:40 am	Electronis & Optoelectronics (part 2)	Health & Medicine (part 2)	Functional Surfaces (part 2)	LEITMARKT.NRW (part 2)
12:45 pm	Greetings Prof. Dr. Andreas Pinkwart, Minister for Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia Award Ceremony „Best Poster Award“ presented by Young Academics Sponsor Covestro Deutschland AG			
01:15 pm	Lunch Break Exhibition / Poster Exhibition / Business Pitches			
02:45 pm	Keynote 3			
03:30 pm	Electronis & Optoelectronics (part 3)	Regulations, Safety & Social Accceptance	Fibres & Composites	LEITMARKT.NRW (part 3)
05:00 pm	End of the 8th NRW Nano Conference			

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Plenary Session

08:30 am	**Registration**
09:30 am	**Opening of the Exhibition**
10:30 am	**Opening of the 8th NRW Nano Conference** **Greeting and presentation** **Dr.-Ing. Harald Cremer** Cluster NMWP.NRW **Greetings** **Karl-Uwe Bütof** Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia **Thomas Westphal** Economic Development Agency Dortmund
10:50 am	**Plenary Talk** **| Quantum Technologies in Europe** **Prof. Dr. Tommaso Calarco** Director of the Institute of Quantum Control, Peter Grünberg-Institut (PGI-8) and Professor at the University of Cologne **Keynote 1** **| Nanomotors steering autonomous propulsion** **Prof. Dr.-Ing. Nathalie Katsonis** Professor of Chemistry at the MESA+ Institute for Nanotechnology, University of Twente **Keynote 2** **| Health EU: the Human Avatar revolution enabled by micro/nanotechnology and artificial intelligence** **Prof. Adrian M. Ionescu, Ph.D.** Director of the Laboratory of Micro/Nanoelectronic Devices (NANOLAB), Swiss Federal Institute of Technology, Lausanne
12:40 pm	**Exhibition / Poster Exhibition / Business Pitches (01:30 pm - 02:15 pm) / Lunch Break**

	Energy Efficiency (parallel session 1/4)	Characterisation & Simulation: Enablers for Nanotechnology and Materials (parallel session 2/4)
02:30 pm	**| Nanostructured Halide Perovskites: Challenges and Potentials for Optoelectronic and Photocatalytic Applications** PD Dr. Harun Tüysüz, Max-Planck-Institut für Kohlenforschung **| Dielectric nanostructures for light harvesting** Prof. Dr. Martina Schmid, University of Duisburg-Essen **| New Material Properties using Light Induced Structural Generation and Transformation of Nanoscale Functional Layer** Dirk Hauschild, LIMO GmbH **| Scalable laser synthesis of active and stable nanoparticles for heterogeneous catalysis** Dr. Galina Marzun, University of Duisburg-Essen Chair: Dr. Felix Müller, Evonik Industries AG	**| From electrons to materials properties** Prof. Dr. Ralf Drautz, Ruhr-Universität Bochum **| Synthesis of Single Layer Tantalum Disulfide on Gold** Daniela Dombrowski, University of Münster **| Realtime process analysis for the continuous synthesis of colloidal nanoparticles** Dr. Ralph Sperling, Fraunhofer IMM **| Using infrared near-field spectroscopy to analyse the interplay of defects and charge carriers in resistive switching on the nm-scale** Martin Lewin, RWTH Aachen University Chair: Dr. Birgit Hagenhoff, tascon GmbH
04:00 pm	Exhibition / Poster Exhibition / Coffee Break	
04:30 pm	**| Luminescent borate glass ceramics for white LED applications,** Juliane Steinbrück, South Westphalia University of Applied Sciences **| Advanced nanostructured catalyst materials for application in PEM fuel cells** Pit Podleschny, Westphalian University of Applied Sciences **| Mechanochemistry – sustainable chemical reactions** Dr. Birgit Funk, Zoz Group Chair: Dr. Guido Bonati, LIMO GmbH	**| Detection and Characterisation of nanoparticles via stimuli-induced heating** Dr. Christoph Geers, NanoLockin GmbH **| Helium Ion Microscopy: Imaging and Lithography with Nanometer Precision** Dr. Andre Beyer, Bielefeld University **| ToF-SIMS as a Powerful Tool for the Nanocharacterisation of Materials** Dr. Daniel Breitenstein, tascon GmbH Chair: Prof. Dr. Thomas Kuhlbusch, Federal Institute for Occupational Safety and Health (BAuA)
05:30 pm	Poster Session / Exhibition (until 06:30 pm) / Business Pitches (06:00 pm - 06:30 pm)	
07:00 pm	Networking Event with Award Ceremony „Best Exhibitor Award“	

	Start-up Session (parallel session 3/4)	ROCKET – Cross-border KET projects (parallel session 4/4)
02:30 pm	**| NMWP Start-ups – Opportunities, Hurdles, Strategies, Financing at a glance** Matthias Poschmann, NMWP e.V. Dr.-Ing. Harald Cremer, Cluster NMWP.NRW **| Start-up Presentation #1** Dr. Michael Niggemann, Enerthing GmbH **| Offhand speech #1** Dr. Julian Bosch, Intrapore GmbH **| Offhand speech #2** Dr. Hendrik Vollrath, Projektträger Jülich **| Start-up Presentation #2** Philipp Bürling, NUMAFERM GmbH **| Offhand speech #3** Dr. Marie Asano, High-Tech Gründerfonds (HTGF) **| Offhand speech #4** Berat Gider, NRW.BANK Eigenkapitalfinanzierungen	**| ROCKET at a glance** Alex van Geldrop, OostNL | Dirk Kalinowski, Cluster NMWP.NRW **| SAILPro – Safe and Amplified Industrial Laser PROcessing** Sebastian Kohsakowski, University of Duisburg-Essen | Sietse van der Linden, University of Twente **| Application of scientific findings in reality – on the example of a ROCKET-project on antibacterial ceramic** Prof. Dr. Gregor Luthe, Smart Material Printing, Enschede **| SuperSurf - Super precision Surface Measurement System for Fuel Cells** Manuel Rudersdorf, ZBT GmbH **| FAST-PHARMA – Development of a FAST microGC analyzer for PHARMaceutical Applications** Vincent Spiering, Qmicro B.V.
04:00 pm	Exhibition / Poster Exhibition / Coffee Break	
04:30 pm	**| Start-up Presentation #3** Dr. Torsten Mans, Amphos GmbH **| Offhand speech #5** Dr. Paolo Bavaj, Henkel Ventures **| Offhand speech #6** Dr. Uwe Kessel, Rotonda Investor Office **| Offhand speech #7** Nico Hemmann, Sparkasse Dortmund **| Offhand speech #8** Dr. Sebastian Tegethoff, Dr. Robert Harrison, 24IP Law Group Chair part 1 & 2: Dr. Heinz Brückelmann, Cluster NMWP.NRW. *Full presentation titles see page 58ff.*	**| TraHySens – Transfermolding of nanostructured Hydrogen Sensors** Dr. Dieter Ostermann, neo hydrogen sensors GmbH **| Elasto-Tweezers – A novel platform for high-precision cell elasticity measurements** Sebastian Knust, Bielefeld University **| iCoat – Intermittent Coating Technology** Nico Meyer, Coatema Coating Machinery GmbH **| HoDSimVal – A tool for extreme material saving combined with extreme lightweight and extreme forming freedom** Prof. Dr.-Ing. Jürgen Hirsch, HoDforming GmbH Chair part 1 & 2: Ilka Meisel, MWIDE NRW *More information on the ROCKET - Cross-border KET projects Session see page 10.*
05:30 pm	Poster Session / Exhibition (until 06:30 pm) / Business Pitches (06:00 pm - 06:30 pm)	
07:00 pm	Networking Event with Award Ceremony „Best Exhibitor Award“	

	Electronics & Optoelectronics (parallel session 1/4)	Health & Medicine (parallel session 2/4)
09:00 am	Registration	
09:30 am	**| Printed and flexible Electronics** Prof. Dr. Klaus Meerholz, COPT Center, University of Cologne **| Commercialisation of Graphene Photonics for Ultrafast Optical Communication Infrastructure** Dr. Daniel Schall, AMO GmbH **| High-Speed nanowire LEDs for polymer optical fibre and free-space communication** Prof. Dr. Nils Weimann, University of Duisburg-Essen Chair: Prof. Dr. Detlev Grützmacher, Forschungszentrum Jülich	**| From treatment to prevention: eradication of the metabolic syndrome** Dr. Paul H. Smit, BioVolt B.V. **| Production of nanoparticles by low pressure plasma, and illustration of their potential use in medicine** Prof. Stephane Lucas, Ph.D., University of Namur **| DNA Hydrogels for Biomedical Applications** Dr. Gilbert Nöll, University of Siegen Chair: Dr. Holger Winter, CeNTech GmbH
10:40 am	Poster Session / Exhibition / Coffee Break	
11:40 am	**| Current status of MOCVD Production Technology** Prof. Dr. Michael Heuken, AIXTRON SE **| Strain control of exciton-phonon coupling in transition metal dichalcogenide monolayers** Iris Niehues, University of Münster **| On-Chip Waveguide Coupling of Single- Photon Emitters in a Two-Dimensional Semiconductor** Dr. Steffen Michaelis de Vasconcellos, University of Münster Chair: Prof. Dr.-Ing. Max Lemme, AMO GmbH	**| L-Aptamers immobilised on Carbon Nanomembranes (CNMs) as Ultra-sensitive Biosensing Platform** Dr. Nikolaus Meyerbröker, CNM-Technologies GmbH **| Quantification and biodistribution analysis of 57Fe-enriched iron oxide nano-particles by means of LA-ICP-MS and MRI** Prof. Dr. Uwe Karst, University of Münster **| Modelling nanoparticle uptake and intracellular transport into cells and barriers** Dr. Christoffer Åberg, University of Groningen Chair: Dr. Holger Winter, CeNTech GmbH

	Functional Surfaces (parallel session 3/4)	LEITMARKT.NRW (parallel session 4/4)
09:00 am	**Registration**	
09:30 am	**| N.N.** **| From FIB to advanced FIB Nanofabrication: True 3D, multi ion species and large area nanopatterning** Dr. Frank Nouvertne, Raith GmbH **| Functional Surfaces on 3D-Parts by Nanostructuring with Ultrafast Lasers** Dr. Arnold Gillner, Fraunhofer ILT | Kai Winands, Fraunhofer IPT Chair: Dr. Péter Krüger, Covestro Deutschland AG	**| EHoLA** Prof. Dr. Thomas Tröster, Paderborn University **| LHybS** Alan A. Camberg, Paderborn University **| KuMag** Dr. Karl-Heinz Lindner, TWI GmbH **| FilaMem** Dr.-Ing. Hermann Monstadt, Phenox GmbH **| pHMed** Georg Paar, RWTH Aachen University Chair: Dr. Norbert von Thienen, MWIDE NRW
10:40 am	**Poster Session / Exhibition / Coffee Break**	
11:40 am	**| Nanostructured multiphase coatings for wear reduction under thermal load conditions** Hanno Paschke, Fraunhofer Institute for Surface Engineering and Thin Films (IST), Dortmund/ Braunschweig **| Adding advanced functional properties to nanoparticles via low-pressure plasma coating** Prof. Stephane Lucas, Ph.D., University of Namur **| Electroless nickel dispersion coatings for tool and component wear protection** Dr. Jessica Schindhelm, VDEh-Betriebsforschungsinstitut GmbH (BFI) Chair: Monika Lelonek, SmartMembranes GmbH	**| Structured zinc (oxide) layers** Dr. Ingo Küppel, Dörken MKS Systeme GmbH & Co. KG **| Stainless spring-loaded connecting elements** Martin Lindner, University of Siegen **| Intrinsic hybrid composite** Prof. Dr. Robert Brandt, University of Siegen **| FunALD** Dr. Dorothee Dietz, Fraunhofer IMS *More information and full presentation titles on the Leitmarkt.NRW session see page 10 and 47ff.* Chair: Dr. Ulrich Sydlik, MULNV NRW

Plenary Session

12.45 pm

Greeting
Prof. Dr. Andreas Pinkwart
Minister for Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia

Award Ceremony "Best Poster Award"

Presentation
Dr.-Ing. Harald Cremer
Cluster Manager NMWP.NRW

Greeting
Dr. Péter Krüger
VP Physics, Covestro Deutschland AG,
Young Academics Sponsor

01:15 pm — Exhibition / Poster Exhibition / Business Pitches (01:45 pm - 02:30 pm) / Lunch Break

02:45 pm

Keynote 3
| Bluetooth inside: an incredible journey
Dr. Jaap Haartsen
Father of Bluetooth, inventor and expert in the area of wireless technologies

Electronics & Optoelectronics (part 3)	Regulations, Safety & Societal Acceptance
03:30 pm	
| Lateral anodic self-oxidation and investigation of the electrical potential drop in circular 2D-nanofilm processors Maximilian Deutsch, University of Münster	**| Inhalation toxicity of nanoparticles – Experimental results and concepts for grouping** PD Dr. Robert Landsiedel, BASF SE
| Playing LEGO with two-dimensional materials: the effect of stacking on the electronic properties of heterostructures of group-III monochalcogenides Dr. Juliana Morbec, University of Duisburg-Essen	**| The Malta Initiative – A European Action to Develop and Amend OECD Technical Guidelines for Testing of Nanomaterials** Dr. Elisabeth Heunisch, Federal Institute for Occupational Safety and Health (BAuA)
| Optical Probing of Charge Carrier Dynamics in Layered SbI3 Alexander Merker, University of Siegen	**| Fate of nanomaterials in municipal waste** Dr. Burkhard Stahlmecke, Institute for Energy and Environmental Technology – IUTA e.V.
Chair: Prof. Dr. Manfred Bayer, TU Dortmund University	Chair: Prof. Dr. Elke Dopp, University of Duisburg-Essen

05:00 pm — End of the 8th NRW Nano Conference

Plenary Session

12.45 pm

Greeting
Prof. Dr. Andreas Pinkwart
Minister for Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia

Award Ceremony „Best Poster Award“

Presentation
Dr.-Ing. Harald Cremer
Cluster Manager NMWP.NRW

Greeting
Dr. Péter Krüger
VP Physics, Covestro Deutschland AG,
Young Academics Sponsor

01:15 pm — Exhibition / Poster Exhibition / Business Pitches (01:45 pm - 02:30 pm) / Lunch Break

02:45 pm

Keynote 3
| Bluetooth inside: an incredible journey
Dr. Jaap Haartsen
Father of Bluetooth, inventor and expert in the area of wireless technologies

Fibres & Composites

03:30 pm

| Future of Fibres & Composites – Lightweight or Digitilization?
Prof. Dr. Thomas Gries,
Institut für Textiltechnik,
RWTH Aachen University

| Development of graphene-modified multifilament yarns for versatile utilisation in textiles
Dr. Benjamin Weise, Maastricht University

| Ferromagnetic nanofiber-guided magnetic signal processing
Prof. Tomasz Blachowicz, Ph.D.,
Silesian University of Technology

Chair: Prof. Dr. Jeanette Orlowsky,
TU Dortmund University

LEITMARKT.NRW (part 3) - projekt talks

| HEA2D
Prof. Dr. Michael Heuken, AIXTRON SE

| HipE
Dr. Philip Stroop, HELLA KGaA Hueck & Co.

| PeroBOOST
Dr. Bert Geyer, COPT Center, University of Cologne

| HiTecMass
Marvin Berger, Fraunhofer IPT

| Photonflex
Thomas Exlager, Coatema Coating Machinery GmbH

More information and full presentation titles on the Leitmarkt.NRW session see page 10 and 47ff.

Chair: Dr. Christiane Fricke, MKW NRW

05:00 pm — End of the 8th NRW Nano Conference

Quantum Technologies in Europe

Prof. Dr. Tommaso Calarco

Director of the Institute of Quantum Control, Peter Grünberg-Institut (PGI-8) at Forschungszentrum Jülich and Professor at the University of Cologne

» Europe needs strategic investment now in order to lead the second quantum revolution. Building upon its scientific excellence, Europe has the opportunity to create a competitive industry for long-term prosperity and security. «

Plenary Talk | 21st November 2018

Nanomotors steering autonomous propulsion

Prof. Dr.-Ing. Nathalie Katsonis

Professor of Chemistry at the MESA+ Institute for Nanotechnology, University of Twente

» Nanoscale molecular machines will drive the adaptive materials of the future. «

Keynote 1 | 21st November 2018

Health EU: the Human Avatar revolution enabled by micro/nanotechnology and artificial intelligence

Prof. Adrian M. Ionescu, Ph.D.

Professor at Swiss Federal Institute of Technology, Lausanne, and Director of the Laboratory of Micro/Nanoelectronic Devices (NANOLAB) and Member of Steering Board Health EU FET Flagship

» Health EU FET Flagship will empower every citizen with a Human Avatar enabling access to comprehensive personalized healthcare, healthy lifestyle and disease prevention. «

Keynote 2 | 21st November 2018

Bluetooth inside: an incredible journey

Dr. Jaap C. Haartsen

Father of Bluetooth, inventor and expert in the area of wireless technologies, founder of JHC2 (Jaap Haartsen Consultancy Company)

» Embedded in more than 25 billion devices, the Bluetooth® wireless technology has become part of our daily life and will remain playing a key role in our future short-range connectivity use scenarios. «

Keynote 3 | 22nd November 2018

Nanostructured Halide Perovskites: Challenges and Potentials for Optoelectronic and Photocatalytic Applications

PD Dr. Harun Tüysüz, Ph.D., Max-Planck-Institut für Kohlenforschung, Mülheim an der Ruhr

As promising semiconductors, halide perovskites have gained a great attention in the field of optoelectronic, in particularly in solar cells, lasers and LEDs, and photocatalysis. The high absorption coefficiency, long charge carrier lifetimes and high charge carrier mobility are making this class of materials fascinating while their instabilities, toxicities and the difficulty over their morphology control are some of the challenges that need to be tackled. This lecture will give some insights for development of nanostructured halide perovskites in well-defined morphologies like photonic crystals, quantum dots and supported nanoclusters and their potential applications for perovskite solar cell, photocatalytic polymerization and oxidation reactions.

Dielectric nanostructures for light harvesting

Prof. Dr. Martina Schmid, University of Duisburg-Essen

Resource efficiency is gaining increased attention, in particular when it comes to (renewable) energy supply. Reducing scarce and expensive elements plays a role in solar energy, yet it may not happen at the expense of light absorption. Therefore, ultrathin absorbers are combined with sophisticated optical concepts based on dielectric nanoparticles. These dielectric nanoparticles foster coupling and directing of light, and thus allow for reduced material consumption at maintained solar absorbance.

In detail, SiO_2 nanostructures integrated into Cu(In,Ga)Se_2 solar cells will be discussed. The optical absorption enhancement in structures with about 80% absorber material reduction is proven and electrical benefits highlighted in addition. Rear-side integration of the nanostructures together with transparent back contacts turns out most beneficial.

Furthermore, as an outlook, microstructured absorbers for operation under concentrator optics and dielectric nanostructures applied as anti-reflection coatings to photoelectrochemical absorbers will be presented.

New Material Properties using Light Induced Structural Generation and Transformation of Nanoscale Functional Layer

Dirk Hauschild, LIMO GmbH, Dortmund

The design and integration of functional layers is the key technology in nearly all electric and electronic applications like micro-electronics, energy storage, photovoltaic, displays, data and energy transmission. By combining large area coating processes with a following precise light induced refinement and transformation process the molecule or nano-particle based material performance can be activated in the whole layer, including the interfaces to neighbouring materials.

Scalable laser synthesis of active and stable nanoparticles for heterogeneous catalysis

Dr. Galina Marzun, University of Duisburg-Essen

Pure inorganic nanoparticles without ligands fabricated by laser ablation in liquids are promising materials for energy converting materials like heterogeneous catalysts or hydrogen storage materials. We will show how to laser-fabricate colloidal stable and size-controlled nanoparticles made of catalytic active materials (e.g.Pt, Pd, Ni, alloys) with a high productivity rate and the possibility for an up-scale. It will be shown that these particles can be easily supported to carrier structures by electrostatic interactions controlled by the pH. The so prepared heterogeneous catalyst show a comparable high activity but remarkable superior stability at high operating temperatures than the commercial catalyst.

Energy Efficiency

Luminescent borate glass ceramics for white LED applications

Juliane Steinbrück, Faculty of Electrical Engineering,
South Westphalia University of Applied Science, Soest

In high-power LED packages, the increased power density of the LED chip requires temperature-stable phosphors to guarantee long-term colour stability. Here, luminescent borate glasses and glass ceramics represent an interesting alternative. Apart from their good mechanical and thermal stability, they can be easily optically activated by the addition of lanthanide ions. The quantum efficiency of these systems is very promising, but the absolute light yield is relatively low due to weak optical absorption by the lanthanide ions. To overcome this issue, the as-made glasses are processed to glass ceramics in a subsequent annealing step. The optical path length is enhanced by scattering at the grown crystallites and thus the absorption per thickness increases. Luminescence quantum efficiency and photometric far-field studies on lanthanide-activated borate glass ceramics are presented to show the potential of these systems as light converter for LED applications.

Advanced nanostructured catalyst materials for application in PEM fuel cells

Pit Podleschny, Westphalian University of Applied Sciences, Münster

In the present study, nanostructured materials based on platinum were developed in order to overcome the characteristic issues of a fuel cell. The main purpose was to increase the stability, and durability of the catalysts, by improving the corrosion resistance of the carbon support material, which is considered to be the main cause for other degradation mechanisms, like catalyst particles detachment during the fuel cell operation. The first target was to develop Pt/CNF electrodes, with low platinum loading and improved activity. Secondly, Pt-M (M = Co or Ni) alloy nanoparticles were produced, using the electrochemical technique, on the same support material, in order to reduce the platinum amount and moreover to improve stability. Furthermore, a ternary platinum-based alloy was produced using as basis, the Pt-Co electrodes and supplementary adding a small Mn amount. The last type of electrode solves the problem regarding the stability and moreover improves considerably the activity. The preliminary electrochemical investigations reveal that the binary and ternary alloy catalysts exhibit improved performance in comparison to the classical Pt/CNF electrodes.

Mechanochemistry – sustainable chemical reactions

Dr. Birgit Funk, Zoz Group, Wenden

Mechanochemical processing is the term applied to powder processing in which chemical reactions and phase transformations take place during high energy milling due to the application of kinetic energy. An important feature of the process is that plastic deformation and chemical processes occur almost simultaneously. A unique example of such mechanochemical reactions are stoichiometric reactions between materials that form a local surface plasma by sudden breakage of numerous metal-oxygen bonds are also called as tribochemical reactions which were successfully carried out in the high energy mill Simoloyer® CM01-2lm designed and manufactured by Zoz GmbH. The novel materials synthesized in this way have already found application areas such as hydrogen storage materials, gas absorbers, food, pharmaceuticals and also in fine chemical synthesis. This technology has become a large effort in the general field of reactive milling.

From electrons to materials properties

Prof. Dr. Ralf Drautz, Interdisciplinary Centre for Advanced Materials Simulation (ICAMS), Ruhr-Universität Bochum

Density functional theory (DFT) provides a solid description of the interatomic interaction in materials. The computational expense of DFT makes the direct calculation of thermodynamic and kinetic properties from the interatomic interaction difficult. We coarse grain DFT at two levels of approximation to tight-binding and to the analytic Bond-Order Potentials (BOPs) to allow for faster and larger simulations. Because of the derivation of BOPs from DFT, contributions of magnetism and charge transfer are directly taken into account. The BOPs are orders of magnitude faster than DFT and allow for the direct sampling of thermodynamic observables.

I will discuss the application of the BOPs to simulating finite temperature magnetism in iron and the prediction of some mechanical properties. I will further discuss atomic simulations for phase stability, nucleation and solid-solid transformations with relevance to high-temperature materials.

Synthesis of Single Layer Tantalum Disulfide on Gold

Daniela Dombrowski, University of Münster

We synthesize the transition metal dichalcogenide tantalum disulfide (TaS_2) on the Au(111)-surface by a combination of physical and chemical vapor deposition using H_2S as sulfur precursor. With scanning tunnelling microscopy we investigate the influence of the preparation parameters on the structure of TaS_2 on the atomic scale and find that the most critical factor is the sulfurization of the tantalum. The different sulfurization results in two phases: β- and δ-phase. Both phases have a very similar lattice structure, even though the β-phase contains less sulfur. We can reversible switch between the two phases by annealing with or without a sulfur atmosphere. Furthermore, we use the different properties of the two phases to select a certain orientation by a two-step synthesis.

Finally, we probe the electronic structure by scanning tunnelling spectroscopy and angle resolved photoemission spectroscopy and find that that the δ -phase corresponds to the 1H-phase of TaS_2.

Realtime process analysis for the continuous synthesis of colloidal nanoparticles

Dr. Ralph Sperling, Fraunhofer Institute for Microengineering and Microsystems (IMM), Mainz

One of the major challenges in nanoparticle synthesis is to achieve reproducible and constant product quality. Microreaction technology provides a convincing tool to transfer common batch synthesis, in which reproducibility and scalability may not be trivial, to continuous processes. The synthesis of colloidal quantum dots is a superb example for a process that can benefit from flow chemistry and inline process analytics by UV-vis spectroscopy.

The combination of continuous synthesis with real-time analytics has two main advantages:
1. Constant and reproducible product quality by a stable and tightly controlled process;
2. The ability to tune the running process to achieve the desired product quality.

Using infrared near-field spectroscopy to analyse the interplay of defects and charge carriers in resistive switching on the nm-scale

Martin Lewin, Institute of Physics (IA), RWTH Aachen

Resistively switching oxides and phase change materials are promising candidates for future memory and storage applications. The detailed interplay of charge carriers and local defects remains unclear and needs to be studied to enable novel device concepts. Infrared spectroscopy offers the possibility to analyse the electronic and structural properties even below an insulating capping layer, but its spatial resolution is limited by diffraction to several µm. We exploit the subwavelength spatial resolution of scattering-type Scanning Near-field Optical Microscopy (s-SNOM) to perform a nm-scale infrared analysis of the widely studied role models Sb_2Te_3 and $SrTiO_3$. Thus, we reveal that the formation of infrared domains with different charge carrier densities in Sb_2Te_3 is not limited to nano-platelets, but can be also found on epitaxially grown thin films.
In combination with electron microscopy and a thorough defect chemical treatment, we prove the accumulation of electrons at grain boundaries in donor-doped $Sr_{1-x}La_xTiO_3$ ceramics.

Detection and Characterisation of nanoparticles via stimuli-induced heating

Dr. Christoph Geers, NanoLockin GmbH, Fribourg

A large variety of methods exists to analyze engineered nanoparticles (NPs) in liquid or solid complex environments, however, depending on the environment the methods suffer from limitations in complexity of sample preparation, NP specifications or data analysis requiring specific expertise.

We have developed a new technique based on lock-in-thermography (LIT) to measure and quantify the heat produced by NPs upon light stimulation. This heat can be recorded with an infrared camera and is processed by a specially developed LIT algorithm to yield 2D-images for detection of NPs and analysis of their properties (e.g. aggregation, dissolution). The advantage of this set-up is the fast and accurate detection of NPs in a variety of matrices, without requiring complicated sample preparation and a large analysis area detection of NPs in a variety of matrices, without requiring complicated sample preparation and a large analysis area.

Helium Ion Microscopy: Imaging and Lithography with Nanometer Precision

Dr. Andre Beyer, Physics Faculty, Bielefeld University

The helium ion microscope (HIM) is a charged particle microscope employing helium ions for probing the sample. In the low dose regime, the HIM operates as microscope, high doses enable material modification and sputtering. Compared to conventional focussed ion beams (FIB) using metal ions like gallium, the HIM offers a very small focal spot size down to 0.35 nm and a strongly localized sputter interaction with the material.

This contribution will present examples of imaging and local milling of two-dimensional nanostructures with helium ion microscopy. In particular, carbon nanomembranes (CNMs) and graphene will be discussed. CNMs are made by a combination of molecular self-assembly, radiation-induced cross-linking and the detachment of the cross-linked monolayer from its substrate. It will be shown that the focused helium ion beam of the HIM can be utilized to create nanopores with diameters down to 1.3 nm.

ToF-SIMS as a Powerful Tool for the Nanocharacterisation of Materials

Dr. Daniel Breitenstein, Tascon GmbH, Münster

The detection of nanoparticles (NP) in the organism is an essential part of nanotoxicological research. In this respect, versatile methods to identify NP in tissue sections still have to be optimized. At present, detection of NP is carried out e.g. by fluorescence light microscopy (FLM), enhanced darkfield microscopy (DFM), laser ablation ICP-MS (LA-ICP-MS), Micro X-Ray Fluorescence Microscopy (µXRF), or Ion beam Microscopy (IBM). However, these techniques often need to be combined to circumvent limited lateral resolution or missing chemical identification.

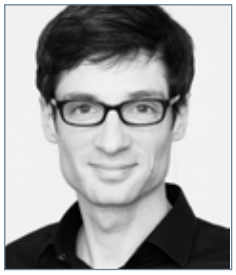
Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) allows the detection of the chemical composition without the use of markers, and at lateral resolutions below 100 nm. Here, experiments were conducted to compare the results obtained with ToF-SIMS and one of the above mentioned techniques using various NP.

Overall, the results show that ToF-SIMS is well suited for the detection of individual inorganic nanoparticles within cell tissue preparations.

Printed and flexible Electronics

Prof. Dr. Klaus Meerholz, COPT Center, University of Cologne

This talk will give an overview about the most recent trends in the field of "Printed and flexible Electronics". It will then focus on the activities in North Rhine-Westphalia specifically at the Center for Organic Production Technologies (COPT) at Cologne. Finally, we will report on selected examples of ongoing projects.



Commercialization of Graphene Photonics for Ultrafast Optical Communication Infrastructure

Dr. Daniel Schall, AMO GmbH, Aachen

The backbone of today's communication society is made from optical fiber links that carry massive amount of data in and between datacenters. Pivotal technical parameters that decide whether or not the infrastructure can keep pace with the exponentially increasing demand for data are bandwidth per lane and energy consumption. Breakthrough performance improvement regarding these two major figures of merit can be expected from monolithic integration of electronic and photonic circuits on one chip. The unique properties of graphene, particularly the integration on virtually any rigid or flexible substrate and the one-of-a-kind optical performance, render it most attractive as active material in photonic circuits.
In this talk I will give an introduction to graphene photonics, discuss our latest results on wafer scale fabrication and I will provide an outline on commercialization.

Electronics & Optoelectronics

High-Speed nanowire LEDs for polymer optical fibre and free-space communication

Prof. Dr. Nils Weimann, Center for Semiconductor Technology and Optoelectronics, University of Duisburg-Essen,

Semiconductor nanowires emerged from fundamental research to the eve of application. Its unique topology and an almost infinite combination of heterojunctions made the nanowire to the by far highest functionality nanostructure, enabling new applications in photonics and electronics.

In-car and in-door data communication requires cheap and easy to handle light sources. InGaN/GaN quantum well light-emitting diodes (LEDs) cover the blue-green spectral regime but suffer from long carrier lifetimes in c-plane InGaN/GaN quantum wells. An exciting development is the use of c-plane grown GaN nanowires as a template for subsequent growth of polarization-free radial junctions orthogonal to the c-direction. A GaN-based nanowire LED array on Si(111) substrate was fabricated, where m-plane InGaN/GaN multiple quantum well active layers were wrapped around c-plane GaN nanowires. The measured temporal LED response allowed for an on-off keying operation at about 1 Gb/s, suitable for indoor communication.

Current status of MOCVD Production Technology

Prof. Dr. Michael Heuken, AIXTRON SE, Herzogenrath

The paper reports recent advances in MOCVD equipment, reactor chamber and process technology in the light of current and upcoming major applications for compound semiconductors. Among the technology drivers are wide bandgap high power and high frequency transistors (HEMTs), light emitting devices (LEDs) for display technology and surface emitting infrared lasers (VCSELs). The state of the art in production automation will be displayed. Typical wafer sizes (from 4 inch to 200 mm) and epitaxy growth times favor multi-wafer reactors for high wafer through-put and low manufacturing costs. To this end automated casset-te-to-cassette wafer loading and unloading has been realized for a multi-wafer configuration. In-situ tool chamber etch clean based on chlorine chemistries is employed for both the GaAs and the GaN chamber type after each growth run. The beneficial effects for run-to-run repeatabi-lity and for particle and defect control without compromising the process results are demonstrated.

Electronics & Optoelectronics

Strain control of exciton-phonon coupling in transition metal dichalcogenide monolayers

Iris Niehues, Institute of Physics and Center for Nanotechnology, University of Münster

Transition metal dichalcogenide (TMDC) monolayers can sustain mechanical strain of about 10 % without breaking. The excitonic line shape is governed by the strong exciton-phonon interaction at room temperature.We demonstrate that the electron-phonon interaction in atomically thin TMDCs can be engineered by applying mechanical strain. We measure absorption and photoluminescence spectra of monolayer $MoSe_2$, WSe_2, WS_2, and MoS_2 under uniaxial tensile strain, focusing on the line shape of the A exciton. For the selenium-based monolayers $MoSe_2$ and WSe_2 the line width narrows and becomes more symmetric with increasing strain. In contrast, the line width stays constant in monolayer WS_2 and even increases for MoS_2. We attribute these effects to the modified electron-phonon coupling due to changes in the electronic band structure in the different monolayer materials. Our results highlight the strong influence of mechanical strain on the exciton-phonon interaction in monolayer transition metal dichalcogenides.

On-Chip Waveguide Coupling of Single-Photon Emitters in a Two-Dimensional Semiconductor

Dr. Steffen Michaelis de Vasconcellos, Institute of Physics and Center for Nanotechnology, University of Münster

Single-photon sources are important building blocks for quantum technology. We report on single-photon emitters in the layered semiconductor gallium selenide. The photoluminescence emission reveals several bright emission centers in the GaSe crystal, which exhibit typically two emission maxima.

On-chip coupling of these single-photon emitters is demonstrated by placing GaSe crystals onto nanophotonic waveguides. The high index of refraction of the GaSe crystal results in a modified hybrid mode structure efficient for light coupling. The hybrid integration of passive photonic circuitry with active single-photon emitters decouples the implementation of the desired light sources from the realization of the scalable quantum photonic architecture. Layered 2D materials will allow for upscaling with parallel transfer techniques or direct growth on the photonic chip.

Lateral anodic self-oxidation and investigation of the electrical potential drop in circular 2D-nanofilm processors

Maximilian Deutsch, Institute of Physical Chemistry and Center for Nanotechnology, University of Münster

Nanofilm processors are a new kind of paper-thin self-writing smart labels based on an electrochemical cell. The self-writing effect is based on the self-powered anodic oxidation of a nanoscale aluminum layer within. To an external observer, the transition from opaque metallic aluminum to the transparent oxidized area looks like an opening curtain, which releases arbitrary visual information. This process is directed in one direction.

To expand the field of possible applications of this technology, we dilate the process of lateral anodic oxidation to a second dimension.
We focus our investigations on the electrical properties of the oxidation process, which is self-powered by the difference of the electrochemical potential between the aluminum and a suitable counter electrode.
We were able to determine the differences in potential drop with rising oxidation length for both one- and two-dimensional nanofilm processors. Based on this knowledge, we develop 2D-nanofilm processors with well controlled lateral oxidation.

Playing LEGO with two-dimensional materials: the effect of stacking on the electronic properties of heterostructures of group-III monochalcogenides

Dr. Juliana M. Morbec, Faculty of Physics, University of Duisburg-Essen

The two-dimensional group-III monochalcogenides GaS, GaSe, InS, and InSe are promising materials for optoelectronics and solar energy conversion. The effect of stacking on the band edge positions and the band gaps in heterostructures are important for these applications. In this talk I will present a theoretical investigation on how the valence and conduction bands of GaS, GaSe, InS and InSe are affected by stacking in homobilayers and heterostructures. I will discuss both cases of commensurate and incommensurate heterostructures, by comparing the cost of stretching the layers to form commensurate structures with the energetic cost due to the lack of proper registry in the incommensurate systems. I will also discuss the effect of strain on the band gaps and band edge positions of the monolayer systems and I will use these results to demonstrate the consequences of different stacking for the band alignment of the GaS/GaSe and GaSe/InS heterostructures.

Electronics & Optoelectronics

Optical Probing of Charge Carrier Dynamics in Layered SbI3

Alexander Merker, Physical Chemistry, University of Siegen

Compounds featuring octahedral halide coordination, such as bismuth iodide, double-perovskite structures and vacancy-ordered perovskite derivatives, have recently caught considerable attention as low-toxic thin film materials for optoelectronic applications and solar light-harvesting. Here, we present a detailed investigation of the related compound SbI_3 on a mesoporous titanium dioxide nanoparticle film using ultrafast UV-Vis-NIR transient absorption spectroscopy after excitation at 400 nm. We observe clear, but quite weak, excitonic features in the transient absorption spectra, located in the wavelength range 450-650 nm. Accurate time constants are extracted and assigned to carrier cooling and recombination processes. We observe weaker electron-phonon coupling and larger recombination times than in the previously investigated sister compound BiI_3. Such layered antimony materials might be therefore more suitable for optoelectronic applications than their bismuth-based counterparts.

From treatment to prevention: eradication of the metabolic syndrome

Dr. Paul H. Smit, BioVolt B.V., Enschede

Many of the world's most deadly and costly diseases are due to our lifestyle, and in particular to the food that we eat. Based on flawed dietary guidelines an obesity epidemic scourges the world. Over 2 billion people are overweight or obese, the result of our metabolic systems' response to how much and what we eat. The result is a continuous rise in diabetes, cardiovascular disease and stroke, cancer, dementia and more.

As we unravel the secrets of our metabolic systems and the differences between individuals, ever more possibilities to fine tune our food to our needs become apparent. This is creating a strong demand for nanotechnology-based devices that measure the characteristics of the food composition and our individual response on a regular basis. The promise is to optimize your work-eat-exercise-relax balance. A host of new devices will move the emphasis from treating to avoiding many diseases.

Production of nanoparticles by low pressure plasma, and illustration of their potential use in medecine

Prof. Stephane Lucas, Ph.D., Namur Institute of Structured Matter (NISM) & NAmur Research Institute of LIfe Science (NARILIS), University of Namur

Because of their interesting properties, production of well-dispersed metallic and non-metallic nanoparticles with controlled size and shape is increasingly necessary to improve technological and medical applications. Among all methodologies to produce spherical and non-agglomerated nanoparticles, one can cite magnetron sputtering at high pressure. In this lecture, we will first describe how this technique can be used to produce metallic and non-metallic nanoparticles (Ag, TiO_2, Au, Y, C, ...). Second, we will focus on the Au case as radiosensitizers for cancer treatment by either proton or photon beams. We will describe Au NP production by low pressure plasma, bioconjugation with monoclonal antibody, in vitro and in vivo cyctotoxicity, and quantitative assessment of tumor dose response relationship measured in vitro but also in vivo.

DNA Hydrogels for Biomedical Applications

Dr. Gilbert Nöll, Organic Chemistry, University of Siegen

Pristine DNA hydrogels are of great interest for biomedical applications such as cell transplant therapy, biomineralization, tissue engineering, gene therapy, drug release, and biosensing. Depending on their sequences they are absolutely biocompatible and biodegradable, they are not immunogenic and their three-dimensional structures can be precisely controlled. However, up to now the usage of DNA hydrogels is limited by the comparably high costs and/or the restricted availability of the branched building blocks used for DNA hydrogel formation, which currently hinders the biomedical industry from exploiting the possible advantages of DNA hydrogels.

To overcome the problem of high production costs we have developed a biotechnological strategy to produce DNA hydrogels from plasmid DNA. As by this new strategy the production costs of DNA hydrogels can be decreased by orders of magnitude, the University of Siegen has filed two patents to protect this new hydrogel production strategy.

L-Aptamers immobilised on Carbon Nanomembranes (CNMs) as Ultra-sensitive Biosensing Platform

Nikolaus Meyerbröker, CNM Technologies GmbH, Bielefeld

We present a label-free biosensor platform consisting of biostable, non-natural L-RNA aptamers as analyte-specific capture probes for ultra-sensitive detection of biomolecules. The L-aptamers are immobilised on the sensor surface via an ultra-thin carbon nanomembrane (CNM). The CNM acts as a universal nanointerposer by offering functional groups that enable aptamer immobilisation on otherwise unsuitable surfaces.

The CNM does not only prevent an undesired L-aptamers-surface interaction which competes with the L-aptamers-target binding. Furthermore, due to the thinness of just 1-2 nm, the CNM interfere only minimally with the detection of target binding in sensors that are sensitive to distance at which the binding occurs.

This was demonstrated with a commercially available surface-plasmon resonance (SPR) sensor system. As targets for detection we used the human hunger hormone ghrelin as well as several chemokines. We showed the ability of the CNM-L-aptamer sensor not only with pure targets but also with real-life samples (e.g. nasal swab) which emphasises the feasibility in point-of-care (PoC) diagnostics.

Health & Medicine

Quantification and biodistribution analysis of ^{57}Fe-enriched iron oxide nanoparticles by means of LA-ICP-MS and MRI

Prof. Dr. Uwe Karst, Institute of Inorganic and Analytical Chemistry, University of Münster

The biodistribution of iron oxide nanoparticles (ION), innovative contrast agents for magnetic resonance imaging (MRI), was analyzed. Because of the high natural iron background, ^{57}Fe-enriched IONs were used to distinguish between the natural iron and iron from the nanoparticles. Various organs of healthy mice (liver, kidney, spleen and brain) were scanned at various time points after injection of the contrast agents with MRI (in vivo) first and were then analyzed with laser ablation coupled to inductively coupled plasma - mass spectrometry (LA-ICP-MS, ex vivo). The two isotopes ^{56}Fe and ^{57}Fe were quantified specifically in consideration of the natural isotopic ratio of these isotopes. Additionally, homogenized organ samples were analyzed by means of ICP-MS to determine statistically relevant results. Enrichment of the ^{57}Fe IONs was detected in all analyzed organs by quantification and by changes in the ratio from ^{57}Fe to ^{56}Fe.

Modelling nanoparticle uptake and intracellular transport into cells and barriers

Dr. Christoffer Åberg, University of Groningen

Drug delivery using nano-sized carriers has promised to revolutionize medicine, but has yet to reach the clinic in large numbers. There is a growing awareness that we may need to understand the fundamental principles of how nano-sized objects interact with tissue, biological barriers and cells before we can design better nanomedicines. Here, we describe our current understanding of how nano-sized objects are taken up by and distribute inside cells, and how to incorporate this knowledge into mathematical models. We show how mathematical modelling can aid in resolving whether nano-sized objects which have entered cells ever exit again, a key question for understanding bioaccumulation and biopersistence. We also discuss the related question of how cell cycle progression couples to the cellular accumulation of nano-sized objects. Furthermore, we present a phenomenological view of how nano-sized objects enter cells. We end with discussing how these processes appear to take place in cell barriers.

Inhalation toxicity of nanoparticles – Experimental results and concepts for grouping

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

Inhalation of aerosols containing nanoparticles is recognized as potential concern, especially in the occupational context. Generally, regulatory toxicity testing requires comprehensive rat inhalation studies. Short-term inhalation study (STIS) allow reducing the use of animals in accordance with the 3Rs principle. The lecture will give an overview of STIS results.

In many cases animal testing may be further reduced or avoided by grouping of particles with similar toxicity profiles. The DF4nanoGrouping will be presented; it facilitates grouping and targeted testing of nanoparticles.

The long-term effects of nanoparticle inhalation were less studied but are now addressed by a project carried out jointly by the Federal Environment Ministry, the Federal Environment Agency, the Federal Institute for Occupational Safety and Health, BASF SE and the Fraunhofer Institute for Toxicology and Experimental Medicine (ITEM). First results of this study showed lung inflammations but no nanoparticle-related tumour formations in the lung and no extrapulmonary effects.

The Malta Initiative – A European Action to Develop and Amend OECD Technical Guidelines for Testing of Nanomaterials

Dr. Elisabeth Heunisch, Federal Institute for Occupational Safety and Health (BAuA), Berlin

The proposed additions to the REACH-Annexes related to characterisation and testing of nanomaterials by the European Commission was accepted end of May 2018. With theses ammendments to the annexes several nanomaterial endpoints will have to be reported. However validated, standardized and harmonized test methods for nanomaterials are currently not available for all endpoints. Therefore the Malta Initiative was started as a common activitiy of the European Commission and the Memberstates to work on filling this gap. The purpose is to adapt or develop new OECD test guidelines and guidance documents to be applicable for nanomaterials as the guidelines are mutually accepted by all OECD members worldwide.

With this presentation we want to inform about the progress with regard to OECD activities related to REACH and nanosafety, we want to facilitate the communication and cooperation between research, public bodies, regulation and industry, and present the ongoing activity of the Malta Initiative.

Regulations, Safety & Societal Acceptance

Fate of nanomaterials in municipal waste

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

The increasing use of nanoparticles within consumer products leads finally to their release into waste streams. The main treatment of municipal waste within Europe is waste incineration. Thus, the question arises what kind of transformations of the nanoparticles occur and if a release is possible during or after incineration. In recent studies this question was tackled in lab scale incineration experiments using only a nanoparticle compound material or by very complex studies conducted at full scale municipal waste incineration plants.

To achieve a reasonable experimental complexity while reducing issues encountered in full-scale systems we studied the incineration of an artificial waste (40% wood, 28% plastics, 18% textile fibres, 10% metal and 4% glass) spiked with nanoparticles or their bulk analogues (nominally 0.36 wt-% of total waste dry mass) in a rotary kiln furnace. Flue gas and solid residues were analyzed to close the mass balance of the particles.

From FIB to advanced FIB Nanofabrication: True 3D, multi ion species and large area nanopatterning

Dr. Frank Nouvertne, Raith Nanofabrication GmbH, Dortmund

Multi-technique nanofabrication instrumentation comprising both an electron and an ion beam optics (FIB-SEM systems) have proven to be flexible tools enabling a broad range of nanotechnology applications. They are regarded as a "must have" in today's R&D based laboratories of various disciplines and routinely provide nanopatterning resolution with sub 10nm feature sizes thus being well suited for nano-research – excellent beam control provided.

With our latest generation of FIB- (and SEM-) technology integrated into a true lithography platform in conjunction with innovative patterning control and strategies, we have accomplished to fully unlock their true nanopatterning potential securing stable, reproducible, highest precise and efficient operation for optimum results and device performance – also over large areas in the cm-regime.

We will present a set of 2D-and 3D-applications with stitching error free patterning control and various ion species in quantum technologies, optics, telecommunication, plasmonics, nanofluidics and nanobiotechnology.

Functional Surfaces on 3D-Parts by Nanostructuring with Ultrafast Lasers

Dr. Arnold Gillner, Fraunhofer Institute for Laser Technology ILT, Aachen |
Kai Winands, Fraunhofer Institute for Production Technology IPT, Aachen

Functional surfaces with specific optical, haptic, tribological and wetting properties have been proven their functionality in nature. Nowadays they can be realized on technical surfaces by using ultra short pulsed (USP) laser radiation. Soft touch, anti-fingerprint as well as tailored friction are terms from technical applications. In this context, also the fabrication of nanostructures with USP is often named.
However, for many industrial applications it is of major importance to be able to functionalize large surface areas fast and without geometrical limitations.
Therefore, the two Fraunhofer institutes have developed novel solutions – innovative scaling strategies like multi-beam structuring and fast beam deflection for large area surface structuring as well as the automated CAM controlled placement and alignment of nanostructures on 3D surfaces within machine tools equipped with USP lasers for local adapted surface functionalization. The presented solutions are major steps towards the exploitation of surface functionalization with USP for industrial applications.

Nanostructured multiphase coatings for wear reduction under thermal load conditions

Hanno Paschke, Fraunhofer Institute for Surface Engineering and Thin Films (IST), Dortmund/Braunschweig

With increasing demands for an enhanced service life time of tools in the hot forming industry, new and innovative wear protecting coating systems are mandatory. In order to further enhance the performance of the tool surfaces, new coating materials are needed. Nanostructured multiphase coatings, generated from carbides, nitrides, borides or silicides of the transient metal titanium can provide these properties. Currently, the binary and ternary Phases TiN, TiC, TiB_2 or TiCN, TiBN are commonly used, yet limited in their thermal stability. These coating systems are expanded with silicon to synthetize quaternary or quinary coating systems, which are utilized under high thermal load conditions (700-1000°C). It seems that they are capable to preserve or even optimize their mechanical properties while changing their structural composition in nanoscale dimensions as investigated recently with in-situ phase analyses of the temperature dependent phase transformation.

Adding advanced functional properties to nanoparticles via low-pressure plasma coating

Prof. Stephane Lucas, Ph.D., Namur Institute of Structured Matter (NISM) & NAmur Research Institute of LIfe Science (NARILIS), University of Namur

Due to their intrinsic physico-chemical properties and the development of production capacities, nanoparticles are increasingly integrated in various industrial products. However, their excessive reactivity due to high surface-to-volume ratio and their tendency to agglomerate are generally affecting their optimal use. Coating can solve these problems by creating a protective layer and changing the surface interaction with matrices. In this lecture, we will illustrate the surface modification of both oxide-based and metallic nanoparticles for the purpose of better dispersability in sol/gel and barrier to oxidation. The composition and the morphology of coatings were characterized by XPS, TEM, TGA and the formation of an effective protective layer around nanoparticles that changes the material properties from hydrophilic to hydrophobic was demonstrated. Further analysis, regarding the nanoparticles' behaviour in various media was examined by using the Hansen Solubility Parameters theory.

Electroless nickel dispersion coatings for tool and component wear protection

Dr. Jessica Schindhelm, VDEh-Betriebsforschungsinstitut GmbH, Düsseldorf

In material processing the surface of tools and components used are subject to high wear, whereas the kind of wear is depending on the kind of process. It is known, that electroless nickel dispersion coatings with application adjusted dispersion particles, e.g. hard or dry lubricant particles, have the potential to be suitable wear protection coatings for different kinds of tools and components.

In different studies, the VDEh-Betriebsforschungsinstitut GmbH has evaluated the use of several kinds of particles with different size, shape and composition in electroless nickel dispersion coatings in mutiple applications, such as hot form rolling or sliding bearings. The results show, that by choosing the kind of dispersion particle according to the application, tool and component life can be extended significantly.

Future of Fibres & Composites - Lightweight or Digitalization?

Prof. Dr. Thomas Gries, Institut für Textiltechnik of RWTH Aachen University

Technical textiles or Composites are used for multidisciplinary design of structural and non-structural components. With the tailored placement of smart fibres, and using 3D and 4D textile technology, researchers at ITA are now able to create and develop integral smart structures with multi-functional characteristics.

Using principles of digitization, we can now create innovative system designs, perform feasibility product and process analyses, and commercialise these smart customised lightweight products. With integrated smart fibres in composites based materials and using digitisation technology, the user can now realise and implement the next generation mobility solutions. Digitization enables the monitoring of these mobility systems through an extensively con-nected online network.

An innovative blend of using an all-digital design approach with smart mate-rials, from design to operation, is critical for addressing future societal mobil-ity challenges. A case study presenting such a digital design based approach for development and operation of smart aircrafts for intercity passenger and cargo transport will be presented.

Development of graphene-modified multifilament yarns for versatile utilization in textiles

Dr. Benjamin Weise, Aachen-Maastricht Institute for Biobased Materials, Maastricht University

Graphene, the two-dimensional allotrope of carbon does not only possess potential for high-performance nanoelectronics, but also for next-generation fibre materials which are widely named as smart textiles. In the proposed talk, the research work on graphene-modified fibres and textiles which has been recently carried out at AMIBM of Maastricht University and ITA of RWTH Aachen will be presented.

Potential applications of graphene-modified fibres detected in the research work are textile supercapacitors as well as Terahertz shielding materials and water-repellent materials. Recently developed demonstrators of textile supercapacitors show capacities of up to 50 mF/g. Incident EM radiation ranging from 100 GHz to 1 THz had been attenuated up to 10 dB in lab-scale shielding experiments. Besides the electrical properties, also the water absorption of graphene-modified woven fabrics was analysed in comparison to neat polyamide-6 woven fabrics. At this, textile samples had been plunged into distilled water for 24 hours and subsequently investigated with respect to their mass increase. As the mass of neat polyamide tripled, the graphene-modified fabrics' mass increased only of 70 % thus making them attractive for filter applications or as water-repellent layer in dikes.

Fibres & Composites

Ferromagnetic nanofiber-guided magnetic signal processing

Prof. Tomasz Blachowicz, Ph.D., Silesian University of Technology, Gliwice

Computers nowadays are based on the so-called von Neumann architecture, separating processor and storage unit. For several problems, however, architecture similar to the human brain in which calculation and data storage are connected would make more sense. This new research area of "adaptive computing" or "neuromorphic computing" mostly aims at developing new software architectures allowing for computational operations similar to the human brain, but still being based on common hardware.

In a recent project (funded by Volkswagen Foundation), new hardware is being developed, based on multifunctional (e.g. magnetic and conductive) nanofibers which are created by electrospinning. Their magnetic properties are investigated experimentally and by micromagnetic simulations.

The oral presentation will give an overview of recent experimental and theoretical results and depict possibilities to use such magnetic fibers for data storage and transfer, e.g. by time-dependent magnetic fields.

EHoLA
Property-optimised wood composites for the ecological lightweight construction of automobiles
Prof. Dr. Thomas Tröster, LiA, Paderborn University

The Chair of Automotive Lightweight Design (LiA) at the University of Paderborn has investigated possible applications of renewable wood material for various components in vehicle structures. Since April 2016, LiA and five industrial partners are working on the research project "Property-optimized wood composites for the ecological lightweight construction of automobiles" (EHoLA). Within the project a comprehensive screening of various wood and wood composites, as well as material characterizations for FEM calculations, have been performed. The results of the screening process were used to develop specific wood materials optimized for the respective applications or requirement profiles. Based on the results, the suitability of wood composites for structural parts can be evaluated and the potential for lightweight design can be deduced. In order to validate the results, two demonstrators made of wood, one for a crash relevant component and one for a reinforcing element, will be designed and manufactured.

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LHybS
Lightweight design by novel hybrid materials
Alan A. Camberg, LiA, Paderborn University

Automotive lightweight design is a considerable measure to meet the worldwide need for reducing CO_2 emissions. However, the lightweight potential of common materials like steel, aluminum or even fiber-reinforcement plastics is limited. To account for these limitations, a novel numerical approach is established to identify hybrid materials with tailored through-thickness properties and improved specific mechanical characteristics. A major challenge of such hybrid laminates is the adhesion between the individual laminate layers. Here, the bond strength is improved by short-pulse laser nano- and micro-structuring as well as by the chemical functionalization of the metallic surface. Furthermore, bionic-based adhesion promoters with inherent stiffness gradients developed within the project help to improve the mechanical properties of hybrid laminates. In order to increase the formability of hybrid sheets an individual and local adaption of fibre reinforcements is introduced. Finally, the LHybS approach allows a weight reduction of up to 25%.

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KuMag
Development of hybrid plastic/magnesium composites for ultra-lightweight applications

Dr.-Ing. Karl-Heinz Lindner, TWI GmbH, Holzwickede

The joining of magnesium with plastic opens the possibility of a beneficial combination of different properties to a hybrid material. The newly developed material compound, which is generated by deep drawing of a novel magnesium wrought alloy (innomag® 20 = Mg-2Mn-RE; RE= rare earth elements) and back injection molding of a glass fibre reinforced thermoplastic material, is leading to a cost-efficient production of light-weight and resilient structures with a high functional integration.
For the manufacturing of the magnesium sheets by extrusion of an open tube and expanding to a flat material a process route (innomag® sheet) was developed, which allows the production of semifinished parts with different wall thicknesses (tailored sheets) by the geometry of the extrusion tool. In the combination of magnesium with plastic especially after corrosion impact the bond strength is playing a crucial role. The newly developed pretreatment process based on JUBOcoat 1060 offers excellent corrosion protection and adhesion properties. In the project „KuMag“ the recent experiences will be used to modify the magnesium surfaces in the magnesium/plastic hybrid. Involved partners are: IKV (RWTH Aachen), IUL (TU Dortmund), JUBO Technologies GmbH (Wuppertal), KODA Stanz- und Biegetechnik GmbH (Holzwickede) and TWI GmbH (Holzwickede).

FilaMem
Development of biofunctional hybrid membranes for long-term implant materials

Dr.-Ing. Hermann Monstadt, Phenox GmbH, Bochum

The EFRE founded project “FilaMem” aims to realize the development of biofunctional nanofiber based hybrid membranes for long-term implant materials and preclinical evaluation of an innovative stent composite system for neurovascular therapy.
Material combination and innovative electrohydrodynamic processing yields a novel biofunctional nanofiber network. Ultra-short pulse laser technology is used to produce thin-walled carrier stent structures.
The integration of nanofibrous membranes on endovascular stents results in a composite system with superior functionality and biocompatibility: The nanofibrous membrane enables blood flow modulation to stop the inflow into an aneurysm. It also prevents the unspecific protein adsorption and promotes the adhesion of endothelial cells to encourage the formation of a new cell layer.
Highly delicate stent structures enable delivery through thin and flexible microcatheters and an adaption to tortuous vessel anatomies.

The cooperation between academic and industrial partners generates innovative solutions, which open up new therapeutic options for the treatment of intracranial aneurysms.

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pHMed
Microgel-functionalized PLA-filaments with pH-optimized degradation behaviour
Georg-Philipp Paar, Institut für Textiltechnik of RWTH Aachen University

Polylactideacid (PLA) is a commercially used biodegradable material for sutures, drug delivery systems and osteosynthesis systems. Furthermore, PLA-filaments are commonly used in meshes and tissue engineering scaffolds. The in vivo degradation of PLA via hydrolysis can cause local acidosis in the surrounding tissue leading to dramatic clinical complications, such as massive inflammatory reaction.
A successful approach for buffering the drop of pH during degradation of PLA-filaments is incorporation of amine based microgels.
These pH-responsive colloidal polymer networks are heat sensitive and therefore are incorporated using a solution spinning process. However, the uncontrolled distribution of the microgels in the filaments causes instabilities during the spinning process. Furthermore, the tensile strength of the filament strongly varies.

Therefore, a bi-component solution spinning process is developed, which allows spatially defined incorporation of microgels in PLA-filaments. Filaments, which are suitable for further textile processing and show pH-neutral degradation behaviour, shall be produced by combination of a strength-giving component and a buffering component (e.g sheath-core structure).

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Structured zinc (oxide) layers
Combination of electrochemically produced microstructured zinc coatings and nanostructured zinc oxide coatings as environmentally friendly coating systems
Dr. Ingo Klüppel, Dörken MKS Systeme GmbH & Co. KG, Herdecke

For the corrosion protection of steel and galvanised steel Chromium passivation systems that may also contain Cr(VI), Co or Ni are still state of the art. If the usage of these ingredients is avoided the performance, e.g. the corrosion protection properties are reduced. So far different zinc and zinc alloy layers, conversion coatings and nano coatings were tested. But until now there are no kathodic corrosion protection system based on pure zinc with a defined nano structure. Furthermore the renunciation of harmful heavy metal components had not yet been completely fulfilled.

Therefore the partners University Paderborn, Parker Hannifin and Dörken MKS started a joint project in 2017 with the aim to develop an environmentally compatible electroplating system for steel substrates. The road to success should be an innovative zinc or zinc alloy or hybridlayer in combination with a nanostructure passivation layer. The corrosion properties should be comparable with those of classic systems.

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Stainless spring-loaded connecting elements

Martin Lindner, University of Siegen

The manufacturing of stainless spring-loaded connecting elements requires a separation of the cold forming and the heat treatment processes. Therefore, the main objective of this project is the development of a stainless maraging spring steel that exhibits the desired mechanical and corrosion properties needed for the application of a spring-loaded connecting element. An appropriate process route for the manufacturing, including the forming and heat treatment processes, will be developed. The corrosion resistance of this new material is a central topic of this project.

InHyb
An intrinsic hybrid composite for cyclically stressed components

Prof. Dr. Robert Brandt, University of Siegen

An intrinsic hybrid composite is made by combining different materials in a primary shaping or a forming process. In this research project an intrinsic hybrid composite for cyclically stressed components has been developed. The intrinsic hybrid composite is composed of glass fibre reinforced plastics and steel. The development approach contains modelling, material development, material-testing as well as application development.

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FunALD
Generation of functional ultrathin materials by Atomic Layer Deposition for the next generation of nanosystems technology
Dr. Dorothee Dietz, Fraunhofer Institute for Microelectronic Circuits and Systems IMS, Duisburg

Within the frame of this project, the atomic layer deposition (ALD) is analysed as a new method for material manufacturing, especially for sensor technologies. With the ALD technology, material layers can be deposited ultrathin – atomic layer after atomic layer, so that layers with a thickness less than 50 nm can be deposited. During the project, new metal organic precursors are developed for the ALD process, test structures based on ALD layers or ALD stacks are designed and manufactured and measurement procedures are developed for characterizing the layers. It is tested if the ALD layers can be used for sensor applications and they are improved, especially in respect of gas sensors.

Another feature of these ALD layers is the possibility, to deposit 3D cantilever devices onto electrical devices. Such cantilever nano wires are appertain for high sensitive gas or bio sensors.

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HEA2D
Production, Properties and Applications of 2D Nanomaterials
Prof. Dr. Michael Heuken, AIXTRON SE, Herzogenrath

When integrated into mass production processes, 2D materials have the potential to create integrated and novel products and production solutions that are sustainable in social, economic, and ecological terms. Using 2D materials will help to address topics such as climate change, an environmentally-friendly and affordable energy supply, mobility, and the increasing scarcity of resources, as well as enabling new and innovative solutions to be explored. The joint project is focused on an end-to-end processing chain consisting of various deposition processes for 2D materials, processes for transfer onto plastic foils, and mass integration into plastics components.

One focus of the project is the MOCVD process and the systems technology for the deposition of optically active 2D semiconductor materials. Furthermore, together with the project partners we are working out a roll-to-roll concept for use in the synthesis and transfer of graphene. Together with its project partners, electronic and optoelectronic demonstrators on the basis of 2D semiconductor materials will be manufactured and analyzed.

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HiPe
Highly innovative pixelated phosphors for laser-based emissions in headlamps

Dr.-Ing. Philip Stroop, HELLA GmbH & Co. KGaA, Lippstadt

In the public funded project HipE (Highly innovative pixelated phophors for laser based emissions in headlamps) HELLA GmbH & Co. KGaA and the Fraunhofer Application Center for Inorganic Phosphors in Soest are developing and evaluating methods for contrast optimization of scanning lighting systems. In known scanning lighting systems contrast is always a big issue. For reflective and transmissive scanning system approaches the crosstalk and the Lambertian conversion on the phosphor lead to contrast bleeding. The goal of the project is to improve the reflection properties on the phosphor by separating the surface in pixels (e.g. 100x100 µm).
If a laser beam is directed on this structured surface the neighbouring pixels are separated more clearly in the light distribution. This can be improved by further measures – for example by filling the generated cuts with material. A further challenge which we are going to present is the need of driving the laser with high frequency to generate 2D light distributions with high resolution. On this topic an evaluation of technically possible resolutions will be shown. The topic of laser scanning headlamps is well discussed in different conference contributions. Because of the inherent complexity the research in this field is ongoing for the upcoming years. The presented concept shows a new approach for the contrast optimization which is of huge importance for scanning lighting systems.

PeroBOOST
Towards effective, lead-free, perovskite-based solar cells for the energy transition

Dr. Bert Geyer, COPT Center, University of Cologne

The material class of Perovskites has raised significant interest for next generation photovoltaic applications. Triggered by a high photovoltaic conversion efficiency, many institutes and industrial research departments started investigations to narrow the gap towards an industrial realization. Although Perovskite cells offer the potential of a low-cost roll to roll manufacturing process accompanied by a high efficiency potential, at two major obstacles have been identified that prevent closing this gap. Presently solely lead containing perovskite cells achieve high efficiency values. Due the fact that lead is a controlled substance in electronics, efforts were started to replace lead by alternative metals. However, at least at present perovskite cells with alternative metals are significantly less efficient. In addition, the stability of Perovskite PV-devices is still in its infancy. Hence, further efforts are needed to make Perovskite PV-cells indoor or even outdoor long-term stable.
The “PeroBOOST” project was started to overcome some of these hurdles. It is focusing on two aspects: improving the stability of Perovskite PV-cells, investigating alternative metals with the target of lead-free cells, and developing processes and methods for the scale-up into the industrial scale.

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HiTecMass
Efficient mass production of micro-optic high-technology modules
Marvin Berger, Fraunhofer Institute for Production Technology IPT, Aachen

Miniaturized optics are main-components in many different areas ranging from smart devices over medical products to the area of automotive and mobility. Thus several millions if not billions of small lenses are merged into objectives every year. Therefore, cost-efficient and fast manufacturing and assembly lines are necessary to fulfil the demand for high quality lens systems. However, the optical surface of the small lenses is very susceptible to the smallest production errors, so new manufacturing technologies are needed.

The core idea of the worldwide (also in contrast to the Asian competition) novel approach is the combination of previously separate production steps of the „micro injection moulding" as well as the ultra-precise „function-oriented assembly". By using networked measurement technology and intelligent, self-learning logistics and active assembly concepts (Industrie 4.0 thought), the aim is to increase the quality of micro-optical high-tech products by increasing efficiency in value creation.

Photonflex
Photonic process chain for manufacturing of flexible organic solar cells in a roll-to-roll process
Thomas Exlager, Coatema Coating Machinery GmbH, Dormagen

Since the breakdown of huge parts of the photovoltaic (PV) market, a recovery with solar cells as a vital part of green energy harvesting began. Flexible thin-film photovoltaics are in special focus, enabling new design/ installation possibilities and cost/energy-efficient roll-to-roll production. Especially organic materials offer potential for applications of low-weight and large-area installations (e.g. automotive sector).

Aims of the public-funded project "Photonflex" are the development of innovative approaches for cost-efficient and highly productive manufacturing of flexible organic PV. Manufacturing of flexible PV shall be realised and scaled to the pilot line stage through coating of the active layers. Focus of the project is the usage of laser-based processes for highly dense circuits and efficient drying technology. Additional new encapsulation solutions via laser plastic-welding will be qualified for high-throughput processes. With these technologies North Rhine-Westphalian machine manufacturers are offered processes and system components, giving new opportunities in the flexible PV market.

LEITMARKT.NRW

ROCKET at a glance

Alex van Geldrop, Oost NL, Apeldoorn |
Dirk Kalinowski, Cluster NMWP.NRW, Düsseldorf

ROCKET (Regional Collaboration on Key Enabling Technologies) is an effort to strengthen the Dutch-German ecosystem regarding photonics, micro- and nano-electronics, innovative materials, and nanotechnology. Focus domains are production, health care and energy.

Within the program of ROCKET ten innovation projects and six feasibility studies have been funded and started. While the topics of these projects vary, there is also overlap and synergy as different institutions are working on similar technologies for a range of applications. For each of these projects an effort is made to fasten the progress towards a business-ready product by support from the core partners of the project, namely Oost NL, Cluster NMWP.NRW, Business Cluster Semiconductors (BCS), Novel-T, and Innos-Sperlich.

Most importantly, the activities are resulting in better technology, future-proof companies, better relationships between Dutch and German organizations, and ultimately a stronger ecosystem, unhindered by formal borders.

SAILPro
Safe and Amplified Industrial Laser Processing

Sebastian Kohsakowski, Technical Chemistry, University of Duisburg-Essen I
Sietse van der Linden, Surface Technology and Tribology, University of Twente

Objective of the SAILPro project is to improve the efficiency, accuracy a nd safety of laser-based colloidal nanoparticle production and surface texturing, by introducing a liquid layer on top of a target and ablating the sample material as the pulsed laser beam passes through the liquid layer. Using this approach, not only nanoparticles but also unique surface structures can be generated. Advantages: The nanoparticles are safely entrapped within the liquid, avoiding air born particles. Secondly, the formation of nanoparticles and unique surface structures is supported. That is, more material is removed per laser pulse when compared to processing in air. Thirdly, colloidal stabilization and processing of nanoparticles e.g. deposition onto supports or embedding into polymers a resupported when processing is conducted in a liquid. University of Duisburg-Essen will present results on the production and embedding of nanoparticles, University of Twente results on surface texturing.

ROCKET - Cross-border KET projects

Application of scientific findings in reality – on the example of a ROCKET-project on antibacterial ceramic
Prof. Dr. Gregor Luthe, Smart Material Printing BV, Enschede

The patent-pending invention of an antibacterial non-toxic smart ceramic offers a lot of potential, but how much can be realized in the real world, i.e. in useful products?
The antibacterial effect of the ceramic is based on physical electrostatic properties on the surface. It is antibacterial against MRSA (Methicillin-resistant Staphylococcus aureus) and has the potential to replace Nano silver. MRSA has been suggested to surpass cancer as cause of death in 2040. Nano silver turned out to be more toxic then was assumed first, and in the EU it will be phased out. For 2017 the estimated market volume for Nano silver was ~37.3 billion US $.
The potential of the invention materializes in form of an indoor wall paint for the clinical context (hospitals), a surface coating, and a bio-degradable filament for 3D-printing. We will describe the transfer of lab results from small scale experiments to industrial application.

FAST-PHARMA
Development of a FAST microGC analyzer for PHARMaceutical Applications
Vincent Spiering, Qmicro B.V., Enschede

The progress on the development of a micro Gas Chromatograph (GC) monitoring instrument for pharmaceutical applications is described.
The general working and improvements of the micro-chip based GC, as well as the development of a heated inlet is presented. The heated inlet will allow head space sampling, which enables the monitoring of solvents during the production of pharmaceutical products. The product is developed in collaboration with Aemics B.V. (electronics) and QC1 GmbH (sampling and application).

ROCKET - Cross-border KET projects

TraHySens
Transfermolding of nanostructured hydrogen sensors

Dr. Dieter Ostermann, neoxid group, Neuss

The TraHySens-project deals with the development of transfer moulded Hydrogen Sensors with nanostructured titanium oxide/metal interfaces, humidity- und temperature-sensor and an ASIC which have a sensitivity with respect to H_2 and in which there is no cross sensitivity to propane, methane and water vapor. For this purpose, corresponding elements or wafers and their manufacturing methods have to be developed first. Using these sensors with integrated electronics, heating and temperature/ humidity sensors have to be developed, so that a complete sensor system is created for use.

Elasto-Tweezers: A novel platform for high-precision cell elasticity measurements

Sebastian Knust, Experimental Biophysics and Applied Nanoscience, Faculty of Physics, Bielefeld University

The mechano-elastic properties of human cells are essential for their health and function. In certain diseases like some cancers and cardiomyopathies those properties are altered, which leads to abnormal behaviour of cells. Therefore, high-throughput and high-resolution measurements of cell elasticities can be used to provide insights into the pathomechanisms of these diseases and could allow early diagnosis.

To this end we developed a dual-beam optical tweezers setup with video-based force detection to directly measure both the forces applied to the cell with piconewton resolution and the cell deformation with sub-micrometre resolution. We couple functionalised beads to the cell surface to use as handles. This allows us to perform all elasticity measurements on living cells in suspension (non-adherent) and with superior sensitivity compared to other techniques like optical stretchers.

This novel setup is combined with custom-designed microfluidic cartridges to automatically and reliably form cell-bead complexes, which enables high-throughput measurements.

ROCKET - Cross-border KET projects

iCoat
Intermittent Coating

Dr. Nico Meyer, Coatema Coating Machinery GmbH, Dormagen

Slot dies are originally designed to create homogeneous, endless, full area coatings. Additionally slot-die are offering an intrinsic dosing and a complete enclosure of the whole system. Any patterning was not intended, but today there is an increasing demand for down-web and cross-web patterning while keeping the advantages of slot-die coating.
While down-web stripes are rather simple to be made by appropriate masking, cross-web stripes are much more complicated because they require a frequent precise fast start and stop of the coating process, the so called intermittent coating. There are several different methods to achieve intermittent coating, which more or less work well as long as the viscosity of the coating liquid is rather high. Good examples are battery pastes. But as soon as the viscosity becomes very low (even lower than water) all those current methods fail.

In the iCoat-project Coatema, Holst Centre and VerAutomation optimize 2 slot-die designs and qualify the intermittent coating in the Advanced Multi coAting LInE (AMALIE-Pilot) line at Holst Centre on perovskite solar cells devices.

HoDSimVal - a tool for extreme material saving combined with extreme lightweight and extreme forming freedom

Prof. Dr.-Ing. Jürgen Hirsch, HoDforming GmbH, Düsseldorf

The HoDforming GmbH is aiming at research, development, production and distribution of processes and products for the shaping of metals such as aluminium, steel and others for the use in nearly every application field like automotive, aviation or medical technology. The technology named HDF (Hot Die Forming) is focussed on high-temperature forming of metal flat products (HDF-F) and hollow products (HDF-H), whereby – in addition to the heated metal sheet and hollow tubes – also the forming tools are advantageously permanent tempered.

The ROCKET – HoDSimVal partners are working on the simulation tool to predict forming behaviour and ability of the HDF-F process and enable easy prototyping as the first step and finally also efficient high-volume production. With a look to aluminium, one can find that several high-strength aluminium alloys are already on the market (6xxx & 7xxx), but to produce complex parts there is a lack of adequate manufacturing processes.

ROCKET - Cross-border KET projects

NMWP Start-ups – Opportunities, Hurdles, Strategies, Financing at a glance

Matthias Poschmann, NMWP e.V., Düsseldorf |
Dr.-Ing. Harald Cremer, Cluster NMWP.NRW, Düsseldorf

A short while ago, the State of North Rhine-Westphalia has launched a variety of actions and initiatives to significantly increase the number of business start-ups: For example, First-stop-shops give exhausting advice on the foundation process. But what other incentives and what funding opportunities are there in NRW? And how does the founding phase work?

This talk gives a summary of the world of start-ups in NRW, offers explanations and differentiations of different funding and support opportunities available and prepares the following more detailed talks from a broader point of view. Throughout the talk, the focus are start-ups in key enabling technologies which often have special needs and special obstacles to overcome during the foundation process. The Cluster NMWP.NRW and the NMWP e.V. will acclerate the success of start-ups in the respective field.

Start-up Presentation #1

Dr. Michael Niggemann,
Enerthing GmbH, Köln

Enerthing GmbH was founded in 2016 and is located at the COPT CENTER for organic Electronics at the University of Cologne. Enerthing´s mission is to develop light energy harvesting solutions for electronic devices in our environment that require electrical energy but for which the available light energy would be sufficient. Thus, primary batteries or cables would be obsolete. Our aim is to radically expand the options for solar powered „Things“ by developing 3rd Generation Solar which is efficient, light, flexible and easy to integrate. At Enerthing's lab, next Generation Solar film demonstrators are developed and manufactured, while volume production will be carried out with manufacturing partners.

Enerthing's management team covers expertise in various fields of natural sciences as well as in business development of high-tech start-ups. The company won the "Next Economy Award" in the category technology in 2018.

Offhand speech #1 – EXIST Support Programme

Dr. Julian Bosch,
Intrapore GmbH, Essen

The EXIST Business Start-up Grant supports students, graduates and scientists from universities and research institutes who want to turn their business idea into a business plan. The start-up projects should be innovative technology or knowledge-based projects with significant unique features and good commercial prospects of success. In addition to the EXIST Business Start-up Grant, the EXIST Transfer of Research programme supports outstanding research-oriented projects that involve expensive and high-risk resource development as well as necessary preparations for the start of a start-up.

The company Intrapore GmbH received an EXIST Start-up Grant for their foundation in 2015. The speech therefore sheds light onto the first-hand experiences of Intrapore CEO Dr. Julian Bosch with the application, funding details as well as the funding phase.

Offhand speech #2 - START-UP-Hochschul-Ausgründungen and Gründerstipendium.NRW

Dr. Hendrik Vollrath
Projektträger Jülich

START-UP-Hochschul-Ausgründungen (engl.: Start-up university spin-offs) as well as Gründerstipendium.NRW (engl.: founder scholarship.NRW) are conveyor competitions respectively initiatives by the Federal State of North Rhine-Westphalia (NRW) to stimulate the founding landscape for start-ups. These programs consider that knowledge and technology transfer are of immense importance for science and economy in NRW and aim at triggering the entrepreneurial spirit. Furthermore, the participation in Gründerstipendium.NRW is also possible for non-academics.

The speech gives an overview of the basics and possibilities of the applications, such as eligible projects or application deadlines. It also informs about the financing terms and project conclusions.

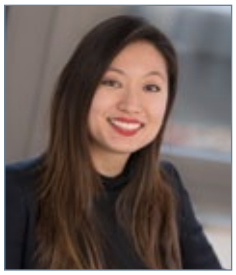
Projektträger Jülich (engl.: Project Management Jülich) is partner of the public sector in science, economy and politics. The PTJ supports clients from the federal and state government and from the European Commission with the mission to realize funding policy objectives.

Start-up Presentation #2

Philipp Bürling,
NUMAFERM GmbH, Düsseldorf

NUMAFERM is a Düsseldorf based biotech Start-up that has developed the first reliable and efficient platform for the bioproduction of peptides. Peptides play a major role in the pharma and cosmetics sector; however, they hold a major potential for applications outside of these. Peptides can have various functionalities, for example surface specific adhesion or antimicrobial activity. Thanks to NUMAFERM, those compounds become now accessible for nanotech applications due to a significant decrease in production cost over the predominant chemical synthesis.

NUMAFERM was founded in 2015 and has 12 employees. The company is a spin-off of the Institute of Biochemistry at the Heinrich Heine University Düsseldorf. In 2017, the two QIAGEN co-founders Prof. Dr. Detlev Riesner and Dr. Jürgen Schumacher, the High-Tech Gründerfonds (HTGF), the European Investment Fund and Evonik Venture Capital invested in the company.

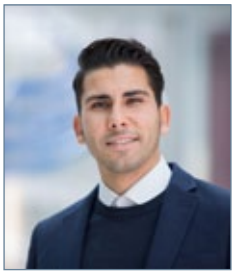


Offhand speech #3 – High-Tech Gründerfonds, the leading German seed-investor for innovative tech-startups

Dr. Marie Asano,
High-Tech Gründerfonds (HTGF), Bonn

The High-Tech Gründerfonds (HTGF) invests in high-tech start-ups across different industries spanning from hardware/ automation/ energy, through to life science/ chemistry, to digital applications and software. Since 2005, about 500 start-ups have received investments from HTGF, of which about one third belong in the Life Science and Chemistry sector. HTGF brings not only seed capital, but actively supports portfolio companies by providing access to a vast network ranging from industry, other investors, and c-level experts for executive hires.

The speech provides basic information about what type of financial investor HTGF is, and how the investment process looks like.



Offhand speech #4 – From Technology to Start-up - Support and Venture Capital by NRW.BANK

Berat Gider,
NRW.BANK Eigenkapitalfinanzierungen

The NRW.BANK.Venture Center is a specialized team for technology based spin-offs from universities and research institutions as well as newly founded start-ups. It gives access to know-how, capital and a profound network of business angels for early stage projects in the preseed phase. Promising technology teams, that suggest the potential of a future venture-oriented growth, are closely accompanied to investment readiness.

Start-up Presentation #3

Dr. Torsten Mans,
Amphos GmbH, Herzogenrath

Founded in 2010, AMPHOS GmbH („Amplifying Photonics“) is a spin-off of the renowned Fraunhofer ILT and RWTH Aachen University based in Herzogenrath near Aachen.

AMPHOS is technology leader in highpower ultrafast lasers due to the use of InnoSlab amplification technology. AMPHOS has pioneered the world of high power ultrafast lasers. The founders of AMPHOS are working on InnoSlab lasers since more than 15 years. Major milestones during that period were the world's first ps-InnoSlab-amplifier (2000), the first kW-InnoSlab Laser (2003), the first Yb:YAG fs-InnoSlab Laser (2007) and the first kW-fs-Laser (2010).

During its founding phase Amphos received EXIST Research Transfer support by the Federal Ministry for Economic Affairs and Energy (BMWi). Nowadays, the company has 47 employees. Since January 2018, AMPHOS is part of the TRUMPF Group.

Offhand speech #5 – Henkel‘s corporate venture capital

Dr. Paolo Bavaj,
Henkel Ventures / Adhesive Technologies, Düsseldorf

Henkel Ventures is Henkel’s corporate venture capital engagement, combining all venture activities across the company’s three business units (Adhesive Technologies, Beauty Care and Laundry & Home Care). Henkel Ventures actively evaluates and manages equity investments and joint development projects with start-up companies to explore new technologies, applications and business models in areas of strategic interest for Henkel.

Henkel Ventures invests into start-ups that are active in one or several of Henkel‘s searchfields, connecting them with the ecosystem of a leading global player. Focus of Henkel Ventures‘ investments are companies in an early phase with Henkel taking a minority stake and a long-term vision.

The speech gives an insight into the help Henkel Ventures offers to start-ups covering far more than the support by financial means - ranging from leveraging the know-how of Henkel to access to a portfolio of leading brands.

Offhand speech #6 – How Start-ups can profit from Business Angels and other Players in the German Start-up ecosystem

Dr. Uwe Kessel,
Rotonda Investor Office, Berlin • Düsseldorf • Frankfurt • Hamburg • Cologne • Munich • Nürnberg • Stuttgart

Young companies with innovative ideas often lack the necessary capital to start the company and thus implement their project. Business angels, like those from Rotonda Investor Office., play an important role in finding investors to fund start-ups, as traditional small business lending at this early stage is typically unattractive to banks due to low margins, high overheads and lack of collateral.

Debt financing via traditional capital instruments is therefore often out of the question for start-up entrepreneurs, while Business Angels can close this gap with equity capital. These „economic angels“ do not only provide the young entrepreneurs with the capital they need, but also with their know-how and network in return to a participation in the new company, so that the start-up as a whole can develop more positively.

This speech gives an overview over the opportunities a collaboration with Business Angels and finance players in the German Start-up ecosystem.

Offhand speech #7 – Regional know-how for business start-ups

Nico Hemmann,
Sparkasse Dortmund: Gründungs- und Innovationscenter, Dortmund

For more than 30 years, Sparkasse Dortmund has been actively involved in business start-ups and public funding for small and medium-sized enterprises (SMEs) within Dortmund. Well over 100 founders are accompanied every year on their way to independence. To this end, the proven Sparkasse financial concept has been further developed to fit the special needs of business start-ups.

This speech gives an overview over the services that the Sparkassen Gründungs- und Innovationscenter Dortmund (engl.: Founding and Innovation Center) provides: From an analysis of the business concept on realisability and plausibility to a tailor-made hedging concept at special conditions for entrepreneurs and companies, the Gründungs- und Innovationscenter accompanies SMEs in all phases of a business start-up.

Furthermore, practical Dos and Don'ts for Business Pitches for important investor meetings will be given from the point of view of an investor himself!

Offhand speech #8 – Basics of intellectual property for Start-ups

Dr. Sebastian Tegethoff, Dr. Robert Harrison,
24IP Law Group, Düsseldorf

The 24IP Law Group is an international group of consultants working in all areas relating to intellectual property (IP). The 24IP Law Group offers advice and supports inventors in safeguarding and enforcing IP for technical inventions, brands, designs and creative achievements. The 24 IP Law Group is multilingual and based in several countries and therefore offers to develop national and international IP strategies for a tailor-made protection of IP serving as a basis for marketing, icensing and commercialization.

The speech sheds light onto the relevance of this topic for Start-ups and gives comprehensive insight into the basics of IP strategies and IP management for start-ups.

Poster Exhibition with Best Poster Award

The NRW Nano-Conference offers a dedicated Poster Session addressing in particular the Young Academic Community. Young scientists have the opportunity to present their latest research, share their ideas, network with each other and potentially meet their prospective employer. Out of nearly 120 posters the three best presentations by Young Academics will be identified by a jury of experts. The winners are honored during the Award Ceremony on the second conference day by a representative of the Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia and the Young Academics Sponsor Covestro Deutschland AG.

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The 24IP Law Group develops IP strategies for a tailor-made protection of IP serving as a basis for marketing, licensing and commercialization.

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booth 36

AIXTRON SE

AIXTRON is a leading provider of deposition equipment to the semiconductor industry. The Company's technology solutions are used by a diverse range of customers worldwide to build advanced components for electronic and opto-electronic applications based on compound semiconductor materials, as well as Carbon Nanotubes (CNT) and other nanomaterials. Such components are used in fiber optic communication systems, wireless and mobile telephony applications, optical and electronic storage devices, computing, signalling and lighting, as well as a range of other leading-edge technologies.

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booth 31

AMO GmbH

AMOs role as a research oriented company headed by Prof. Max Lemme is to close the gap between basic research and industrial application.
For this purpose a high level 400 m² cleanroom is available.
Activities are focused on the identification of potentials in nanotechnology for diverse application in information technology, biotechnology, photonics and sensor technology. AMOs special strengths are in the area of lithography, pattern transfer (e-beam lithography/UV-nanoimprint/RIE etching) and a highly sophisticated research team with experience in process technology and application.

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booth 13

CCM GmbH

CCM GmbH from Overath, near to Cologne, has been designing and supplying Nano coatings for the DIY and industrial sector for over 18 years,
In the DIY sector CCM specialises in the production of consumer nano products as private label items for partner organisations. The main areas of trade are mobile phone, car, fabric, boat, sanitation and domestic coatings. Many of the brands which CCM support are leading suppliers within their sector. In the industrial sector the focus is on stone, car, marine, aviation, sanitation and the hotel sector. CCM exports to over 80 countries worldwide. The company also offers bespoke training and applications.

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booth 42

Center for Nanointegration Duisburg-Essen (CENIDE)

CENIDE stands for the Community of Nano-Researchers at the University of Duisburg-Essen (UDE). It is one of the largest research networks for nano sciences in Germany. From basic research to the production and processing of functional nano materials: more than 70 research groups from the natural and engineering sciences and medicine comes together here. CENIDE members have access to the DFG Core Facility ICAN which runs the Microscopy Center in the NanoEnergyTechnikZentrum (NETZ). CENIDE also works with one of the largest process engineering institutes, the Institute for Energy and Environmental Technology (IUTA), which is an affiliated institute of the UDE, and the CENIDE start-up HSWmaterials.

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booth 24

Center for Nanotechnology (CeNTech)

Starting in 2003 CeNTech offers university research groups from physics, chemistry, biology and medicine as well as young companies with 2.400 m^2 an ideal environment for the transfer of scientific research in nanotechnology into new applications. Thereby the combination of scientific excellence and entrepreneurial thinking is supporting the transfer into marketable products. With the inauguration of CeNTech II in 2011, additional 1.300 m^2 have been allocated to the scientists. Research at CeNTech focuses on nanoanalytics, nanobiotechnology and photonics. Currently 8 companies are located at CeNTech.

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booth 18

Cluster NanoMicroMaterialsPhotonics.NRW

The NanoMicroMaterialsPhotonic.NRW (NMWP.NRW) state cluster is a public service body. It was set up in 2009 by North Rhine-Westphalia´s state government aimed at consolidating NRW's position in nanotechnology, microtechnology, advanced materials and photonics. The cluster operates as an association, i.e. it represents the interests of its members from the respective fields. Specifically, this means that the cluster acts as a network for organisations from industry and commerce, science and politics, for example by organising trade congresses, joint trade fair booths in Germany and abroad, or by initiating workshops on selected topic areas. The cluster also particularly supports cooperation ventures between the corporate, research and political environments in NRW.

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booth 01

CNM Technologies GmbH

CNM Technologies develops and markets carbon nanomembranes (CNMs) for various applications such as sensor technology and filtration/separation. CNMs are molecular thin, Carbon-based polymeric 2D-materials and thus the thinnest possible plastic film. CNM properties include amongst others easy chemical functionalisation, possible intrinsic perforation, and the option of conversion into high-quality graphene sheets.
A variety in production methods – from integration into large area membranes for industrial-scale separation to CMOS-compatible manufacturing for sensor applications – is feasible.

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booth 28

Coatema Coating Machinery GmbH

Coatema offers production equipment and R&D for coating, printing, and laminating plants for Roll to Roll and Sheet to Sheet applications. The family business in second generation has over 40 years of experience in the markets of textile, foil and paper. We offer pilot and production lines for these sectors. 15 years ago the sector of pilot lines was developed where we are market leader in innovative technologies like batteries, fuel cells & printed electronics. The focus on high tech markets, the world class full-service and the most versatile R&D centre for coating, printing and laminating enables us to offer complete Lab 2 Fab technologies.

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booth 11

Comelec SA Parylene-Beschichtung

Parylene is a highly technical coating that is ultra-thin and transparent, physically and chemically neutral, inert, biocompatible, insulating and protective, of a thickness that can be sized both easily and precisely (from 50 nm to 100 microns). It is totally uniform, pinhole-free and can be applied to small technical components. One of its most remarkable advantages is its form-fitting and penetrating nature.
The combination of these qualities make it an extremely interesting player in the most demanding technological fields, including electronics, micro-electronics, space and aeronautics, medical technologies and pharmacology.

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booth 30

COPT (Center for Organic Production Technology) Cologne University

COPT Center is the technology transfer institute of the University of Cologne, Germany. Its task is to develop everyday products having organic and printed electronic functions jointly with industrial partners, predominantly with SME.

At present, COPT focusses on innovative, energy efficient products with integrated Organic Light Emitting Diodes (OLEDs). In addition COPT Center is running projects on 3rd generation solar cells and printed sensors, actuators, transistors, and other electronic components.

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booth 14

Covestro Deutschland AG

With 2017 sales of EUR 14.1 billion, Covestro is among the world's largest polymer companies. Business activities are focused on the manufacture of high-tech polymer materials and the development of innovative solutions for products used in many areas of daily life. The main segments served are the automotive, construction, wood processing and furniture, and electrical and electronics industries. Other sectors include sports and leisure, cosmetics, health and the chemical industry itself. Covestro has 30 production sites worldwide and employs approximately 16,200 people (calculated as full-time equivalents) at the end of 2017.

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booth 04

Cutting Edge Nanomaterials

Cutting-Edge Nanomaterials (CENmat) offers highly specialized and custom-tailored metal based nanomaterials for R&D, industry and academia. Currently CENmat's portfolio includes metal based nanomaterials of 21 metals as alloys, oxides, sulphides, and phosphides or in some cases pure metal nanomaterials. Apart from that CENmat offers consultation as well as services to help you to effectively integrate the nanomaterials in your technology or products.

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booth 40

Elmos Semiconductor AG
Semiconductors and senors

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Elmos develops, produces and markets semiconductors and sensors, primarily for use in the automotive industry. Our components communicate, measure, regulate and control safety, comfort, powertrain and network functions. For over 30 years, Elmos innovations have been bringing new functions to life and making mobility worldwide safer, more comfortable and more energy efficient.

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booth 09

Fibrothelium GmbH

Fibrothelium GmbH was founded as a spin-off from the company Meotec. The company has interdisciplinary experience in the field of material science and material development, especially for medical technology.
The core competence is a unique process for the synthesis of fibroin solutions, which is completely free of toxic solvents. This leads to advantages in the biocompatibility of the material and to low process costs.
The material fibroin offers a wide range of applications in the field of medical technology and also in the food industry and other market fields.

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booth 38

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.

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booth 20

Gesellschaft für Bioanalytik Münster e.V Technology for the Life Sciences

Since 2000 the association bioanalytik-muenster provides a central communication and information platform to access the R&D potential of the comprehensive and unique combination of state-of-the-art nanoanalytical techniques matched by absolute top pre-clinical and clinical research present at the University of Münster. Over 30 SMEs complement this academic research potential and offer cooperation opportunities for R&D projects and solutions for bioanalytical problems in industries such as diagnostics, regenerative medicine, pharma, food and environmental technologies.

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booth 17

Hitachi High-Technologies Europe GmbH

GOLD SPONSOR

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 life sciences, information systems and advanced industrial products. 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 electron, ion beam and atomic force microscopes.

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booth 08

HoDforming GmbH

HoDforming GmbH is aimed at developing and commercializing the so called Hot Die Forming (HDF) technology. The HDF-H (Hollow Bodies) and HDF-F (Flat Bodies) technologies base on optimal tempered blanks and forming dies. HDF allows the forming of extreme high strength metal alloys into almost any shape also with sharp edges. The manufacturing costs will be competitive to today´s cold forming processes.

HDF products and processes - invented by the HoDforming GmbH - are designed to fit the highest industrial standards in all areas. That means, that HDF enables the automotive industry and other branches to realize the most extreme lightweight ever possible, also in mass production.

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booth 37

IVAM

IVAM Microtechnology Network is an international association with members in the fields of microtechnology, nanotechnology, advanced materials, MEMS and photonics. IVAM supports mainly small and medium-sized companies in bringing innovative technologies and products to market and thus securing advantages in international competition. Since 1995 IVAM has been supporting companies and institutions from all around the world. The central mission of the association is to create synergies and to support its members in exchanging knowledge, initiating joint projects and networking with each other and potential customers.

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booth 35

LIMO GmbH

GOLD SPONSOR

LIMO is a leading international specialist for laser beam shaping.
At our headquarters in Dortmund, Germany, an interdisciplinary team made up of more than 200 engineers, physicists, technicians and a host of other sepcialized employees works together to develop and to produce micro-optics and precision optics (e.g. free-form microlens arrays). Additionally we manufacture beam shaping systems / modules and industrial laser systems for many applications including functionalization of nanocale materials and coatings with superior electrical and electronical performance.

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booth 05

Micronit GmbH

At Micronit, we provide innovative Lab-on-a-chip and MEMS solutions using micro- and nanotechnologies. Solutions that help our customers improve theire products and research, contributing to the quality of life.
Research & prototyping services, creative product development and quality manufacturing are our core businesses. Customers gain added value from our unique combination of

- Microfluids and MEMS expertise from design through prototyping to manufacturing
- Materials, from glass to polymers, silicon or hybrid combinations
- Customer application know-how
  This enables our customers to develop winning products

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booth 12

Microtrac GmbH

Microtrac strives to provide innovative, reliable and repeatable particle size, shape and charge instrumentation. Our particle analysis instruments are used in virtually every industry, from pharmaceutical to food processing and by top industry professionals to conduct particle size measurements, zeta potential analyses, 3D image nanalyses, molecular weight and dust characterisation.
Whether you are new to the industry or a seaseoned veteran, we can help you find a solution to fit your specific needs at Microtrac.

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booth 41

MÜNSTER – ALLIANZ FÜR WISSENSCHAFT

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In the "Alliance for Science", partners from science, business and the city are working for the expansion of Münster as a science and business location. The objective of the strategic alliance is to develop Münster as a leading and international competitive location for science, research and development. In addition the aim is to expand a scientific dialogue with the inhabitants of Münster as well as to communicate science and research in applied ways. One strategic focus is set on Nanobioanalytics as the universities as well as the corporate landscape possesses a high level of scientific excellence and products.

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booth 16

NanoCanada

NanoCanada brings together industry, government and academia to examine the barriers in bringing emerging technologies to the marketplace. The enabling and pervasive nature of nanotechnology requires that its commercialization be done in a coordinated and collaborative manner across multiple sectors and disciplines. NanoCanada creates community through a collaborative network, and serves our members through relationship building, and a passion for promoting Canada's excellence in science, innovation, and entrepreneurship, both nationally, and internationally.

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booth 27

National Contact Point Materials of Project Management Jülich
National Contact Point Nanotechnology of VDI Technology GmbH

The National Contact Point Materials of Project Management Jülich and the National Contact Point Nanotechnology of VDI Technology GmbH inform and advice, free-of-charge and on behalf of the German Federal Ministry of Education and Research (BMBF), research institutions and commercial organisations about funding opportunities for materials and nanotechnologies themes and cross-cutting Key Enabling Technologies (CrossKETs) in the EU's Horizon 2020 Framework programme for Research and Innovation.

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booth 03

NUMAFERM GmbH

NUMAFERM is a Düsseldorf based biotech startup that has developed the first reliable and efficient platform for the production of peptides. Peptides play a major role in the pharma and cosmetics sector, however, they hold a major potential for applications outside of these. Peptides can have various functionalities, for example surface specific adhesion or antimicrobial activity. Thanks to NUMAFERM, those compounds become now accessible for nanotech applications due to a significant decrease in production cost over the predominant chemical synthesis. The company was founded in 2015 and has 12 employees.

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booth 39

Optence e.V.

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 component manufacturers, system producers, designers, finishers and product users as well as numerous research organizations and university institutes.

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booth 34

Physical Electronics GmbH

The Physical Electronis GmbH is an owner run company located near Munich, since 1994. Our product portfolio contains leading edge instruments to support you in answering your most complex analytical questions. We offer analytical equipment for Surface Science, Photothermal IR Spectroscopy (PTIR) Organic Analysis and nanomechanical Testing. In case you only have a limited number of samples to be tested, our Analytical Services offer you fast and easy access to our instruments including the support of an analytical expert. We believe the most efficient way to support you is a personal discussion. So feel free to contact us.

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booth 19

PWMN.

We develop professional marketing strategies and provide communication support to companies, research institutes and networks in the field of various technologies such as photonics, materials, microsystems technology and nanotechnology. With a deep understanding of technology and many years of experience in communication in the areas of PR, marketing, corporate communication and advertising, we make complex topics generally easy to understand and bring them into the right channels offline and online. We understand your technology, we recognise its potential and fields of application and we bring you in your customers awareness – as complex as necessary, as simple as possible.

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booth 32

Raith GmbH
Nanofabrication

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Raith is a leading provider and manufacturer of systems for nanofabrication, electron beam lithography, focused ion beam nanofabrication, nanoengineering and reverse engineering. Founded in 1980 and headquartered in Dortmund, Germany, the company offers solutions for researchers and engineers in both academic and industry settings. With nearly 250 employees supporting customers in Europe, the Americas, Asia, and the Pacific region, Raith provides a professional support infrastructure that delivers added value to its customers. Raith counts high-level universities, academic institutions as well as companies in the high technology business among its clientele.

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booth 06

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

ROCKET fosters cross-border cooperation between business and science in the German-Dutch border region to strengthen innovation, research and technological development. 17 consortia, consisting of SMEs and research groups from both countries, have been already supported in the development of new products and services by the ROCKET project. The innovation projects and feasibility studies cover in general more than one of different Key Enabling Technologies to give answers to the global challenges. ROCKET is a joint project of OostNL, BCSemi, Novel-T, innos Sperlich as well as the Cluster NMWP.NRW and part of the INTERREG Deutschland Nederland programme financed by the European Union and the INTERREG partners.

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booth 21

Saxion University of Applied Science / Department of Nanotechnology

The Nanotechnology research groups at Saxion have two main goals:

1) Offer an outstanding interdisciplinary and internationally oriented Bachelor (BSc) and Master (MSc) Programme in Applied Nanotechnology (study duration: 2 years).

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.

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booth 29

SENTECH Gesellschaft für Sensortechnik mbH

SENTECH Instruments develops, manufactures, and globally sells innovative capital equipment. We are focusing on thin-film metrology and plasma technology for semiconductor technology, integrated optics, MEMS, photo-voltaics, nanotechnology and material research.
SENTECH is expert in structuring and deposition of thin films by means of plasma process technology. We are offering systems for plasma etching, plasma enhanced chemical vapor depositon, and atomic layer deposition. Additionally, SENTECH provides innovative solutions for non-contact, non-invasive optical characterization using ellipsometry and reflectometry.

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booth 26

Sugino Machine Limited

SUGINO is a machine manufacturer in Japan. We develop, design, manufacture ultrahigh-pressure water jet equipment, wet jet dispersing device, laboratory dry mill and Biomass nanofibers. “Star Burst” is wet-milling/dispersing equipment to disperse, emulsify, exfoliate and delaminate materials by high speed jet flow from a diamond nozzle.
Star Burst is the ideal partner in the development of Nano-materials and Advanced Materials. “BiNFi-s” is Cellulose nanofiber and nanofibers from several biomass resources. BiNFi-s has great potential in New application fields.

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booth 33

TRUMPF Laser- und Systemtechnik GmbH

The high-technology company TRUMPF offers production solutions in the machine tool and laser sectors. It is driving digital connectivity in manufacturing industry through consulting, platform and software offers. TRUMPF is the world technological and market leader for machine tools used in flexible sheet metal processing, and also for industrial lasers.

In 2016/17, the TRUMPF Group – which has about 12,000 employees – achieved sales of 3.11 billion euros. With over 70 subsidiaries, it is represented in nearly all the countries of Europe, North and South America, and Asia. For more information about TRUMPF go to www.trumpf.com

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booth 22

UA Ruhr
Flagship Program, Materials Science, Solvation Science

University Alliance (UA) Ruhr is a unique and forward-looking academic hub that bundles the activities in research and education of three Ruhr Area universities (Bochum, Dortmund and Duisburg-Essen). The two UA Ruhr flagship programs Materials Chain and RESOLV are jointly presented at the 8th NRW Nano Conference. Research of the Materials Chain covers all phases of modern materials science and production engineering on different length scales. The Cluster of Excellence RESOLV explores the role of solvents at the molecular level in the most diverse chemical processes, to advance sustainable energy sources and smart sensor technology.

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booth 25

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. Fields of research include e.g. topics like Cyber-Physical Systems and Interfaces or "smart materials" based on nanotechnologies.

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booth 07

WESSLING GmbH

SILVER SPONSOR

WESSLING is an international and independent laboratory, testing and consulting company represented at 25 locations in Europe and China. The family-owned company enjoys an excellent reputation among national and international customers since 1983. 1,400 employees work with great expertise on the continuous improvement of quality and safety, and of environmental and health protection. We examine, analyse and assess, we plan and implement projects – for the sustainable improvement of the quality of life.

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City of Dortmund
Economic Development
Agency

Wirtschaftsförderung Dortmund

Whether mechanical engineering, electrical engineering or materials – Dortmund's production industry enjoys a first-class reputation around the world. With over 40 companies and around 3,000 employees, the city is one of Europe's leading locations for micro- and nanotechnology in particular. Dortmund creates a unique environment for economic growth and settlement. The city offers a dynamic mix of a lively start-up scene, specialist suppliers and international market leaders. Together, they form the basis for success. Be part of this development.
We'll see you – in Dortmund.

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booth 02

enterprise europe network
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NRW.Europa

ZENIT GmbH / NRW.Europa

Under the name of NRW.Europa, ZENIT GmbH, NRW.BANK and NRW.International GmbH 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 main target group are small and medium-sized enterprises (SMEs).

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booth 23

Zoz Group

Zoz Group

Zoz Group manufactures Mechanical Process Engineering Equipment and Nanostructured Materials in form of powder, layers and bulk parts up to magnetic filters, batteries, hydrogen-drives with H2 solid state absorber tanks incl. vehicles. Affiliated companies serve E- and E-H2-mobility, entertain a ZEV-Auto-Fleet, a public technology center, a student's dormitory, solar energy- fuelcell- and electrolyzing plants as well as aircraft operations. Zoz GmbH is listed in the German Hidden Champions and under permanent observation of the German Export Control.

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booth 10

Overview Exhibitors

Exhibitor	Booth
24IP Law Group Patent- und Rechtsanwälte	36
AIXTRON SE	31
AMO GmbH	13
CCM GmbH	42
Center for Nanointegration Duisburg-Essen (CENIDE)	24
Center for Nanotechnology (CeNTech)	18
Cluster NanoMicroMaterialsPhotonics	01
CNM Technologies GmbH	28
Coatema Coating Maschinery GmbH	11
Comelec SA Parylene-Beschichtung	30
COPT Center	14
Covestro Deutschland AG	04
Cutting Edge Nanomaterials (CENmat) / **Start-up Corner**	40
Elmos Seminconductor AG	09
Fibrothelium GmbH / **Start-up Corner**	38
Fraunhofer Institute for Laser Technology (Fraunhofer ILT)	20
Gesellschaft für Bioanalytik Münster e.V.	17
Hitachi High-Technologies Europe GmbH	08
HoDforming GmbH / **Start-up Corner**	37
IVAM Fachverband für Mikrotechnik	35
LIMO GmbH	05
Micronit GmbH	12
Microtrac GmbH	41
Münster - Allianz für Wissenschaft	16
NanoCanada	27
National Contact Point Materials / National Contact Point Nanotechnology	03
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Exhibitor	Booth
Optence e.V.	34
Physical Electronics GmbH	19
PWMN	32
Raith GmbH Nanofabrication	06
ROCKET INTERREG V A-Project	21
Saxion University of Applied Sciences / Department of Nanotechnology	29
SENTECH Gesellschaft für Sensortechnik mbH	26
Sugino Machine Limited	33
Trumpf Laser- uns Systemtechnik GmbH	22
Universitätsallianz Ruhr (UA Ruhr)	25
Universität Siegen / Naturwissenschaftlich-Technische Fakultät	07
WESSLING GmbH	15
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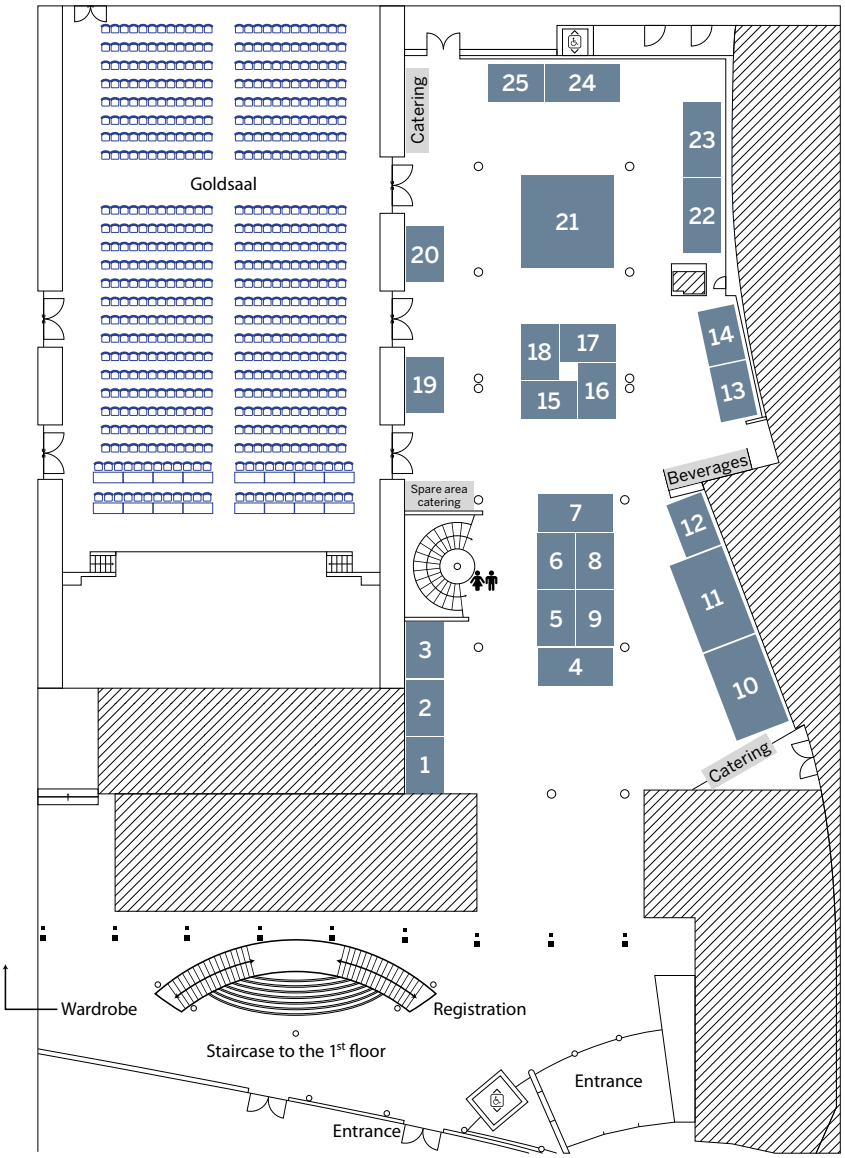
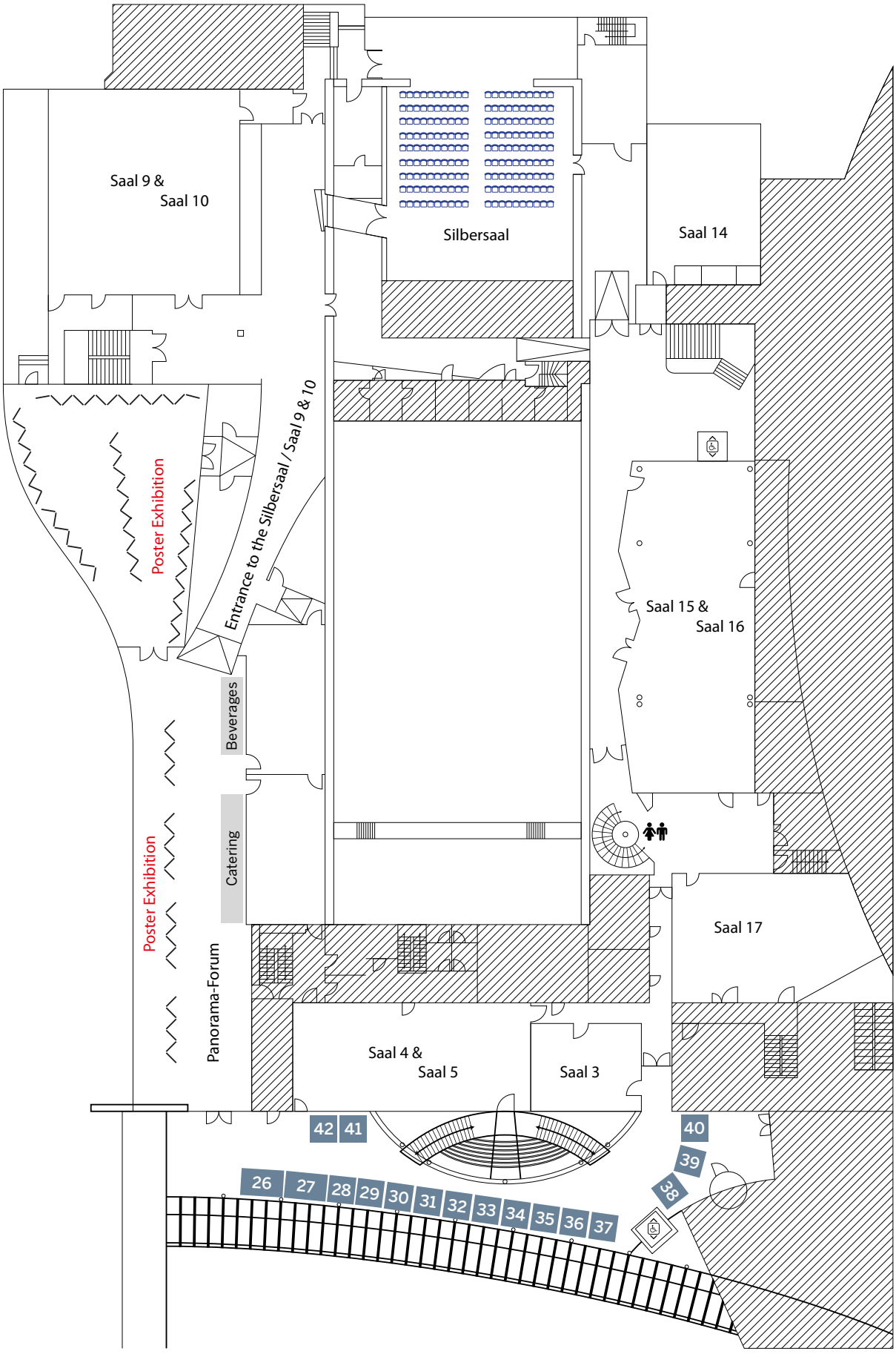
Room Allocation

The Plenary Sessions on Wednesday morning and on Thursday noon take place in the "Goldsaal", while the four parallel topical sessions take place in the conference halls and rooms "Goldsaal", "Silbersaal", "Saal 9 & Saal 10" and "Saal 15 & Saal 16".

The Business Pitches take place in the conference rooms "Saal 9 & Saal 10", while the Matchmaking Area is located in "Saal 4 & Saal 5". Here, you will find some workplaces as well.



1st Floor Plan



Networking Event with Award Ceremony "Best Exhibitor Award"

Networking and exchange at the highest level – the Networking Event on the evening of the first conference day provides a great opportunity to establish and deepen contacts. With food, drinks and music, the first day of the 8th NRW Nano Conference comes to an end in a relaxed atmosphere.

The event starts at 7.00 pm and takes place in a very exciting location: The "Deutsches Fußballmuseum" Dortmund. In the run-up of the programme, guests can take an exclusive tour through the museum and have a look at the original ball from the legendary final in Bern and other unique exhibits. The official programme starts at 8.00 pm.

As part of the Networking Event, the Best Exhibitor Award will be presented to the three exhibitors with the best exhibition stands and most intriguing exhibits.

About the location

DEUTSCHES FUSSBALL MUSEUM

The "Deutsches Fußballmuseum" at the heart of the Ruhr area in Dortmund is an ideal day out for visitors of all ages. A total of 25 hours of video footage and some 1,600 exhibits can be discovered.

The "Deutsches Fußballmuseum" is located close to the main train station and is part of an art and culture mile between the creative center Dortmunder U and the Konzerthaus Dortmund . The location can best be reached by subway, alighting at Dortmund main station.

On the forecourt of the museum, a Walk of Fame shows footprints of famous German footballers like Fritz Walter and Sepp Herberger.

Deutsches Fußballmuseum
Platz der Deutschen Einheit 1
44137 Dortmund

As the number of participants is limited, prior registration was required.

Nano Workshop powered by KITZ.do

This year, the NRW Nano Conference offers a special programme about the vital subjects of science and technology for our youngest talents. In the Nano Workshop, KITZ.do offers pupils aged 16 and over the opportunity to explore the world of nano-technology with various experiments.

KITZ.do offers many opportunities for children and young people to get a vivid picture of subjects and professions beyond the familiar clichés. Creativity and the realisation of one's own ideas instead of dry numbers and formulas. The offers are intended to promote children's and young people's interest in STEM (Science - Technology - Engineering - Mathematics) and inspire them with STEM. KITZ.do offers children and young people space and opportunities to do their own research and experience "science at first hand".

The workshops are held twice a day and start at 10 a.m. and 12 noon.

Experiments on the following topics are offered:

- Lotus effect
- Ferrofluids
- Creation of hydrophobic surfaces
- Shape memory alloys
- From sand to chip
- Electrically conductive glass surfaces

KITZ.do
NEUGIER MACHT SCHLAU

Business Pitches

The Business Pitches are fast paced company presentations within 240 seconds. They take place in the conference rooms "Saal 9 & Saal 10".

21st November 2018

01.30 - 01.34 pm	**Hitachi High-Technologies Europe GmbH**	06.00 - 06.04 pm	**COPT Center**
01.35 - 01.39 pm	**Universitätsallianz Ruhr (UA Ruhr)**	06.05 - 06.09 pm	**Sugino Machine Limited**
01.40 - 01.44 pm	**Zoz Group**	06.10 - 06.14 pm	**CNM Technologies GmbH**
01.45 - 01.49 pm	**LIMO GmbH**	06.15 - 06.19 pm	**Optence e.V.**
01.50 - 01.54 pm	**PWMN.**	06.20 - 06.24 pm	**Saxion University of Applied Science**
01.55 - 01.59 pm	**Coatema Coating Machinery GmbH**	06.25 - 06.29 pm	**NanoCanada**
02.00 - 02.04 pm	**Covestro Deutschland AG**		
02.05 - 02.09 pm	**Fraunhofer ILT**		
02.10 - 02.14 pm	**NUMAFERM GmbH**		

22nd November 2016

01.45 - 01.49 pm	**National Contact Point Materials & National Contact Point Nanotechnology**
01.50 - 01.54 pm	**IBE R&D gGmbH**
01.55 - 01.59 pm	**Microtrac GmbH**
02.00 - 02.04 pm	**CCM GmbH**
02.05 - 02.09 pm	**tascon GmbH**
02.10 - 02.14 pm	**Elmos Semiconductor AG**
02.15 - 02.19 pm	**Raith GmbH Nanofabrication**
02.20 - 02.24 pm	**Cutting Edge Nanomaterials**
02.25 - 02.29 pm	**Physical Electronics GmbH**

University Alliance Ruhr
with its flagship programs “RESOLV” and “Materials Chain”

University Alliance (UA) Ruhr is a unique and forward-looking academic hub that bundles the activities in research and education of three Ruhr Area universities (Bochum, Dortmund and Duisburg-Essen).

UA RUHR

RUHR UNIVERSITÄT BOCHUM RUB

technische universität dortmund

UNIVERSITÄT DUISBURG ESSEN
Offen im Denken

The two UA Ruhr flagship programs “Materials Chain” and “RESOLV” are jointly presented at the 8th NRW Nano Conference. Research of the Materials Chain covers all phases of modern materials science and production engineering on different length scales. The Cluster of Excellence RESOLV explores the role of solvents at the molecular level in the most diverse chemical processes, to advance sustainable energy sources and smart sensor technology.

RESOLV
RUHR EXPLORES SOLVATION
CLUSTER OF EXCELLENCE - EXC 1069

Materials Chain
UA RUHR

Booth 25
Visit us at the exhibition of the 8th NRW Nano Conference

University Alliance (UA) Ruhr

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Kompetenznetzwerk Umweltwirtschaft.NRW

nanobay
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Nano in Germany

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