

# COOPERATION IN GROUPS, ALLIANCES AND NETWORKS

ANNUAL REPORT 2018/19

Scientists at Fraunhofer IKTS are active in numerous thematically oriented networks, alliances and groups. Therefore, our customers benefit from having a coordinated range of joint services available to them.

## Membership in Fraunhofer Groups, Alliances and Networks

AGENT-3D

AMA Association for Sensors and Measurement

American Ceramic Society (ACerS)

Association Competence Center for Aerospace and Space Technology Saxony/Thuringia (LRT)

Association for Manufacturing Technology and Development (GFE)

Association of Electrochemical Research Institutes (AGEF)

Association of German Engineers (VDI)

Association of Thermal Spraying (GTS)

biosaxony

BTS Rail Saxony

Carbon Composites (CCeV)

Ceramics Meeting Point Dresden

CiS Forschungsinstitut für Mikrosensorik GmbH

CO<sub>2</sub> Value Europe

Competence Center for Nano Evaluation nanoeva®

Competence Network on Optical Technologies (Optonet)

Cool Silicon

DECHEMA – Society for Chemical Engineering and Biotechnology

DeepSea Mining Alliance

Deutsche Glastechnische Gesellschaft (DGG)

Deutsche Keramische Gesellschaft (DKG/German Ceramic Society)

DIN Standards Committee Information Technology and selected IT Applications (NIA)

DKG/DGM Community Committee

DRESDEN-concept

Dresden Fraunhofer Cluster Nanoanalysis

Dresdner Gesprächskreis der Wirtschaft und der Wissenschaft

ECPE European Cluster for Power Electronics

EIT Health

Energy Saxony

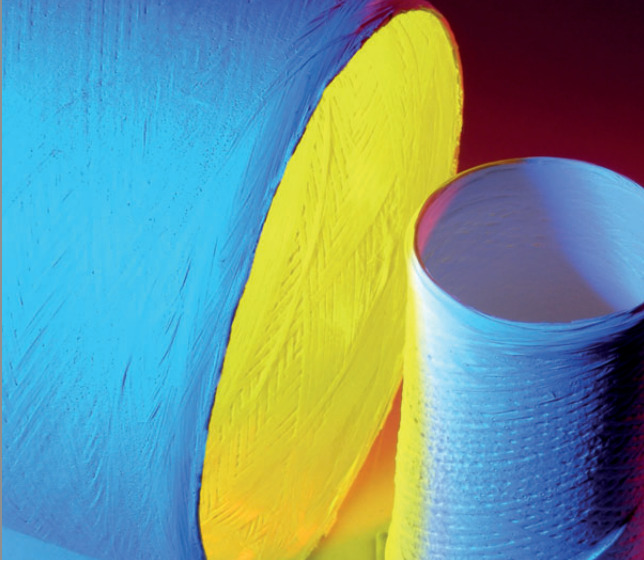
e.qua impuls – Wasserwirtschaftliches Energiezentrum Dresden

European Society of Thin Films (EFDS)

European Network of Materials Research Centres (ENMAT)	Fraunhofer Textile Alliance
European Powder Metallurgy Association (EPMA)	German Association for Small and Medium-sized Businesses (BVMW)
European Research Association for Sheet Metal Working (EFB)	German Association of University Professors and Lecturers (DHV)
Expert Group on Ceramic Injection Molding in the German Ceramic Society	German Biogas Association
Expert Group on High-Temperature Sensing Technology in the German Society for Materials Science	German Chemical Society (GDCh)
Fördergesellschaft Erneuerbare Energien (FEE)	German Electroplating and Surface Treatment Association (DGO)
Fraunhofer Adaptronics Alliance	German Energy Storage Association (BVES)
Fraunhofer Additive Manufacturing Alliance	German Engineering Association (VDMA)
Fraunhofer AdvanCer Alliance	German Federation of Industrial Research Associations (AiF)
Fraunhofer Battery Alliance	German Materials Society (DGM)
Fraunhofer Big Data Alliance	German Society for Membrane Technology (DGMT)
Fraunhofer Energy Alliance	German Society for Non-Destructive Testing (DGZfP)
Fraunhofer Group for Materials and Components – MATERIALS	German Phosphorus-Platform DPP
Fraunhofer Lightweight Design Alliance	German Physical Society
Fraunhofer Nanotechnology Alliance	German Thermoelectric Society (DTG)
Fraunhofer Numerical Simulation of Products and Processes Alliance	HYPOS Hydrogen Power Storage & Solutions East Germany
Fraunhofer Water Systems Alliance (SysWasser)	InDeKo Innovationszentrum Deutschland Korea

## GROUPS, ALLIANCES, NETWORKS

Innovationszentrum Bahntechnik Europa e. V.	smart <sup>3</sup>
Institut für Energie- und Umwelttechnik e. V. (IUTA)	SmartTex Network
International Microelectronics and Packaging Society	Society for Corrosion Protection (GfKORR)
International Zeolite Association	Trägerverein Institut für Holztechnologie Dresden e. V.
KMM-VIN (European Virtual Institute on Knowledge-based Multifunctional Materials AISBL)	TRIDELTA CAMPUS HERMSDORF
Materials Research Network Dresden (MFD)	Thüringer Erneuerbare Energien Netzwerk (ThEEN)
medways	VDMA Medical technology
Meeting of Refractory Experts Freiberg (MORE)	Verein für Regional- und Technikgeschichte e. V. Hermsdorf
Micro-Nanotechnology Thuringia (MNT)	WindEnergy Network Rostock
Nachhaltigkeitsabkommen Thüringen	
NAFEMS – International Association for the Engineering Modelling, Analysis and Simulation Community	
NanoMat – Supraregional Network for Materials Used in Nanotechnology	
Organic Electronics Saxony	
ProcessNet – an Initiative of DECHEMA and VDI-GVC	
Research Association for Diesel Emission Control Technologies (FAD)	
Research Association on Welding and Allied Processes of the German Welding Society (DVS)	
Silicon Saxony	



## FRAUNHOFER GROUP FOR MATERIALS AND COMPONENTS – MATERIALS

Materials research and technology at Fraunhofer covers the entire value chain, from developing new and improving existing materials to manufacturing technology on a quasi-industrial scale, in addition to characterizing properties and assessing service behavior. This also applies to the components and products made from these materials and their system behavior in relevant applications. Where materials are concerned, the Fraunhofer MATERIALS group covers the full spectrum of metals, inorganic non-metals, polymers, and materials made from renewable resources, as well as semiconductor materials. Over the last few years, hybrid materials have gained significantly in importance. The Group uses strategic forecasting to support the development of future-oriented technologies and materials.

With the initiative Materials Data Space® (MDS) founded in 2015, the Group is presenting a roadmap towards Industry 4.0-enabled materials. It considers digitalization of materials along their entire value creation chain as a key requirement for the lasting success of Industry 4.0.

Special attention is also given to the development of customized materials for additive manufacturing, from expanding the range of materials that can be used to developing multi-material systems. Thus the Group is making a significant contribution to maximizing and economically exploiting this promising manufacturing technology.

The importance of renewable energies is rapidly gaining momentum as the energy transition continues. A large number of materials, from copper, steel and concrete to rare earths will be used to generate, store, transport and convert energy, to a significantly greater extent compared with traditional energy supply systems. The Group is addressing this set of questions,

particularly with a view to resource availability and the creation of closed resource cycles for these systems and components.

### Objectives of the Group

- Supporting accelerated innovation in the markets
- Promoting the success of Industry 4.0 through suitable material concepts (digital twins, Materials Data Space®)
- Increasing the success of additive manufacturing with expanded ranges of materials and technologies
- Supporting the energy transition with material efficiency and resource strategies
- Increasing integration density and improving the usability properties of microelectronic devices and microsystems
- Improving the use of raw materials, quality of products manufactured from them, and the development of recycling concepts
- Enhancing safety and comfort as well as reducing resource consumption in the areas of transport, machine and plant construction, building and living
- Increasing the efficiency of systems in the generation, conversion, storage and distribution of energy
- Improving the biocompatibility and function of materials used in medical biotechnical devices, improving material systems for medical diagnosis, disease prevention and therapy
- Improving the protection of people, buildings, infrastructure through high-performance materials in tailored concepts

### Group chairman

Prof. Dr. Ralf B. Wehrspohn, Fraunhofer IMWS  
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GROUPS, ALLIANCES, NETWORKS

## FRAUNHOFER ADVANCER ALLIANCE

### Systems development with high-performance ceramics

The usage of high-performance ceramics allows for new applications in energy engineering, mechanical and plant engineering, and medical technology. Well-known examples are highly efficient tools and coatings, new material and manufacturing technologies for medical-technical products as well as creative solutions for energy and resource saving industrial processes. At present, AdvanCer is working in a joint project developing systems solutions and test methods for the oil and gas industry as well as for deep sea mining. It is the objective to develop new diamond-ceramic and hardmetal materials as well as the appropriate manufacturing technologies. So, components may be realized which allow for the maintenance-free operation in up to 6000 m depth in the sea.

Four Fraunhofer Institutes (IKTS, IPK, ISC/HTL and IWM) have joined together to form the Fraunhofer AdvanCer Alliance. It is the aim of AdvanCer to develop individual systems solutions with advanced ceramics for industry. The research activities of the Fraunhofer Alliance extend along the entire value-added chain from modeling and simulation through application-oriented materials development, production and machining of ceramic parts to component characterization, evaluation and non-destructive testing under application conditions. Development work is conducted and supported by modeling and simulation methods.

Furthermore, AdvanCer has established a comprehensive range of training and consultancy services to support small- and medium-sized companies in solving complex tasks ranging from prototype development to technology transfer.

### Fields of cooperation

- Materials development for structural and functional ceramics, fiber-reinforced ceramics, cermets and ceramic composites
- Component design and development of prototypes
- Systems integration and verification of batch-production capabilities
- Development of powder, fiber and coating technologies
- Materials, component and process simulation
- Materials and component testing
- Defect analysis, failure analysis, quality management
- Analysis of energy demand for thermal processes and to improve energy efficiency
- Increase of efficiency using ceramic components

### Services offered

- Development, testing and evaluation of materials
- Prototype and small series production
- Technology development and technology transfer
- Process analysis and design
- Consulting, feasibility studies, training programs

### Spokesperson of the Alliance

Dr. Michael Zins  
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**1** Test stand for the tribological testing of ceramic materials and components (Source: Dirk Mahler/ Fraunhofer).



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## CERAMICS MEETING POINT – CERAMIC APPLICATIONS

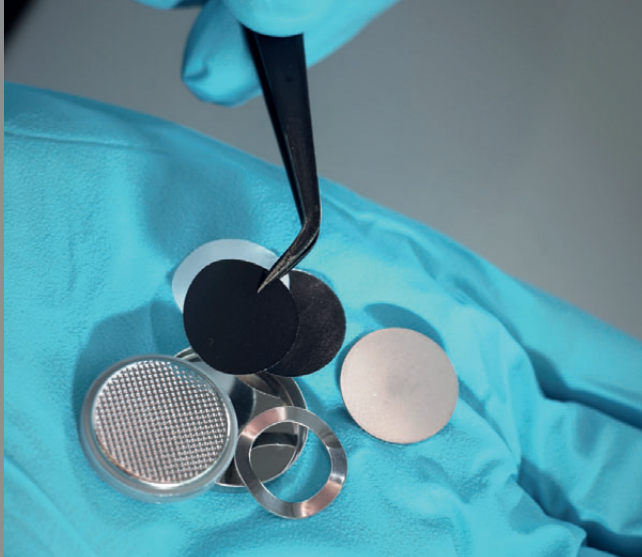
The Ceramics Meeting Point is an integral part of our institute's public relations activities. With this showroom, the institute provides a unique overview of the ceramic engineering market, drawing on its cooperation with the 51 partners and members joined under the label "Ceramic Applications" of the Göller Verlag publishing company. It is a place to take a closer look at the most current research topics, including systems testing. It also offers the opportunity to establish contacts with potential suppliers. This means that users who do not yet have extensive knowledge of the industry can use all Fraunhofer IKTS events as their ideal platform. Networking effects with Fraunhofer-Gesellschaft are enhanced further by including the Fraunhofer AdvanCer Alliance. This makes it possible to represent the complete service portfolio of all institutes.

The seminars organized by the Fraunhofer AdvanCer Alliance, the German Ceramic Society (DKG), and the German Materials Society (DGM) present the state-of-technology in the industry and provide participants with the desired hands-on experience. With this approach, Fraunhofer IKTS provides a project forum, in particular for small- and medium-sized companies, facilitating contacts with project sponsors and research institutions.

The complete manufacturing chain is shown – from the powder to the finished part – and not just from the research perspective, but also as a reflection of the technologies and capacities available in the industry. Visitors gain insight into the current focal points of research while learning which manufacturer commercially supplies which product. In 2018, major topics included applications for the oil and gas industries, and the development of materials for deep-sea applications. Additionally, extremely large-scale machinery components, provided by our partners, expanded the scope of the exhibition – among them as one of the highlights a grinding cylinder manufactured by FCT Ingenieurkeramik GmbH, which weighs close to 400 kg.

In 2018, the Ceramics Meeting Point was a major focal point for the work of special field 1: Chemistry/Plant engineering and construction of the DKG. The exhibition showcases the results emerging from various funding projects.

**1** *Ceramics Meeting Point at Fraunhofer IKTS in Dresden-Gruna.*



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## CENTER FOR ENERGY AND ENVIRONMENTAL CHEMISTRY JENA (CEEC)

The Center for Energy and Environmental Chemistry Jena (CEEC) is an interfaculty center operated jointly by Fraunhofer IKTS and Friedrich Schiller University (FSU) Jena. The CEEC bundles the activities of the two research institutions in the fields of energy conversion, energy storage, and technical environmental chemistry. Focus is mainly on electrochemical energy storage systems and the materials, especially ceramics and polymers, used for them, energy converters, such as solar cells, and innovative water and wastewater treatment methods. There are currently 13 professorships from FSU and 5 departments from IKTS represented at the CEEC. In addition to the new institute building in Jena, which has been in operation since 2015, laboratories and pilot-scale facilities for battery manufacturing and membrane technology are part of the center at IKTS in Hermsdorf.

For IKTS, the CEEC represents a strategic cooperation platform with Friedrich Schiller University Jena, especially in the field of basic research. Numerous joint Master's and PhD theses are organized, joint events offered, research projects initiated, and large-scale equipment used via the center. The "Chemistry – Energy – Environment" Master's program, in which IKTS is particularly prominent with its research activities, is also supervised and overseen by the CEEC and is the only program of its kind offered in Germany.

One focus of the collaboration is the "Technical Environmental Chemistry" chair, which is held by Prof. Michael Stelter, deputy director of Fraunhofer IKTS. The working group is dedicated to water treatment, water purification, and water analysis using novel, combined physical and electrochemical methods, such as ultrasound and hydrodynamic cavitation, electrochemistry, and ceramic membrane technology.

The group thus functions as a bridge to the extensive work being performed at IKTS in Hermsdorf and Dresden.

Additional topics addressed at the CEEC and of particular relevance to IKTS include the following:

- Materials for electrochemical reactors and batteries
- Organic active materials and membranes
- Carbon nanomaterials
- Glasses and optically active materials for photovoltaics and photochemistry
- Physical characterization

### Contact

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1 *Parts of a button cell (Source: Jan-Peter Kasper/FSU Jena).*