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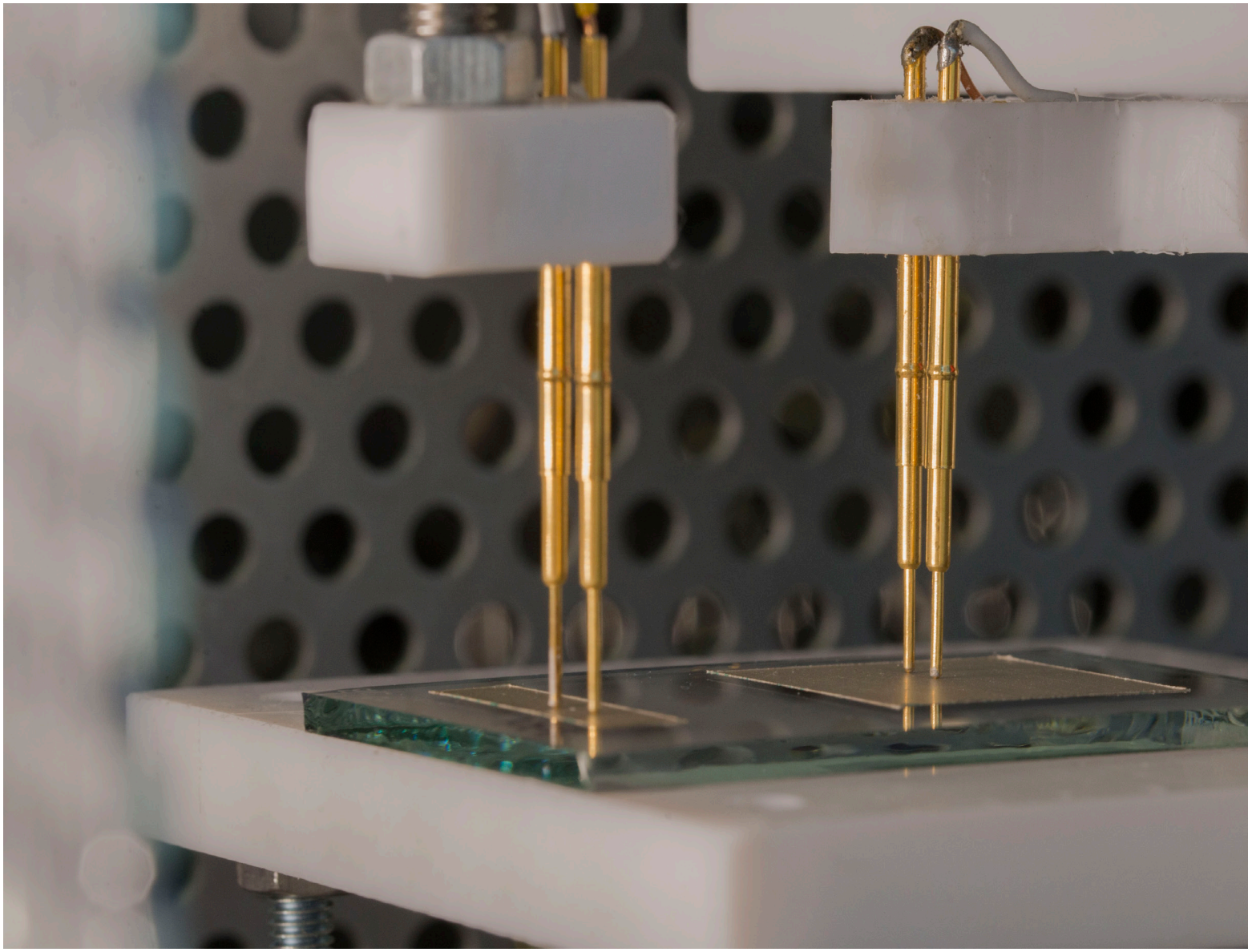
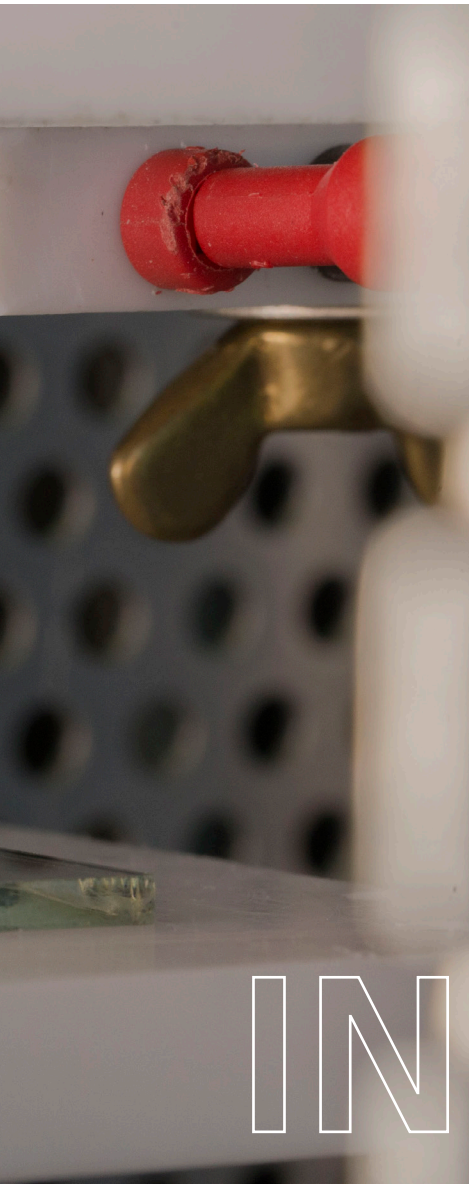
FRAUNHOFER INSTITUTE FOR SILICATE RESEARCH ISC

ANNUAL REPORT 2015 | 16





INSIGHTS ...

Measurement setup for thin film electrodes

Life span, reliability, and performance of a battery are determined by suitable materials, an optimal match between individual components, and a proper design. With its extensive knowledge in these areas, the Center for Applied Electrochemistry develops modern energy storage systems like solid-state or high-energy batteries. The cover page and the picture on the left show a standard setup for conductivity measurements. To perform such tests on the micro scale Fraunhofer ISC uses a scanning electron microscope (SEM).

PREFACE

Dear Friends and Partners of Fraunhofer ISC,
Dear Ladies and Gentlemen,

Within the past few years, Fraunhofer ISC has successfully concluded its transition into an internationally accepted central point of contact for any issues relating to energy and resource efficiency. This clearly confirms our long-term strategy and rewards our efforts for continuous development. Our scientific workshops are popular, information requests pile up, and co-operation offers keep coming in. All this could not have been achieved without the financial and otherwise support granted by the Bavarian State Ministry of Economy, Media, Energy and Technology and the Hessian Ministry for Science and the Arts for which we are truly grateful.

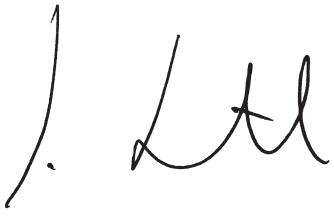
One of the milestones in 2015 was the grand opening of the new laboratory building at the Center HTL in Bayreuth. The building was financed with EU, federal and Bavarian State funds, and Bavarian State Minister Ilse Aigner personally came to celebrate the inauguration with us. Other extension projects are also taking shape now that the second development phase has been approved for the Fraunhofer Project Group IWKS: Thanks to the generous support of the EU, the federal government, the Free State of Bavaria and the State of Hesse, plans are underway for a new laboratory building at each the Alzenau and the Hanau site. 2015 also saw the merger of the two groups and sites of the Bavarian Research and Development Center for Electromobility FZEB under the rooftop of the Fraunhofer ISC in Würzburg, coupled with the confirmation of continued funding for future development.

To no small extent, we owe this move in the right direction to my former deputy Dr. Rolf Ostertag whose foresighted strategic decisions during his many years of dedication paved the road to sure success. He deci ded to retire in mid 2015 and will be truly missed. To honor his achievements for Fraunhofer ISC, we held a farewell colloquium with guest speakers recruited from all phases of his career life e.g. from Daimler AG. At this point, we welcome Dr. Thomas Hofmann, former CEO of Centrosolar Glas GmbH, who succeeded him as deputy director.

Let me take this opportunity to express my gratitude to all staff members of the Fraunhofer ISC – at the parent Institute, in the project group IWKS, and in the Center HTL – and to the staff at the Würzburg University Faculty of Chemical Technology of Material Synthesis for their highly committed, creative, and competent work.

My gratitude also goes out to the Fraunhofer Gesellschaft and all institutional supporters and partners for their continued faith in us and their generous funding of our projects. Special thanks is extended to our project partners from industry and research for fruitful discussions and solution oriented cooperations.

We have selected some recent R&D sample topics for this year's annual report and I truly hope you will enjoy the reading.



Prof. Dr. Gerhard Sextl

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Current projects 2015

INSTITUTE OVERVIEW

THE FRAUNHOFER ISC
AN OVERVIEW

Fraunhofer Institute for Silicate Research ISC

The Fraunhofer ISC has become one of the leading R&D centers on energy and resource efficiency in Bavaria. With a workforce of about 400 scientists and technicians at all locations combined – the Würzburg parent institute, the Bronnbach branch, the Center HTL in Bayreuth and the Project Group IWKS in Alzenau and Hanau – it works to develop innovative materials for today's and tomorrow's products. The focus of the Clusters Materials Chemistry and Application Technology is on the optimization of materials and on efficient manufacturing techniques and processes, in line with industry requirements. The range of services offered by the Center for Applied Analytics includes materials analysis, testing, and characterization and is complemented by the Center of Device Development CeDeD with on demand measuring systems and tools. Safe high performance energy storage materials are the key topic of the Center for Applied Electrochemistry, while the Center Smart Materials CeSMa develops electrically or magnetically switchable "smart" materials for applications in automation, mechatronics, and sensor technology. The Fraunhofer ATTRACT Group "3DNano-Cell" researches biotechnology solutions and tissue engineering.

With its particular interest in resource and energy efficiency, the Fraunhofer ISC is putting great emphasis on sustainability in its development work and seeks to use renewable, eco-friendly raw materials and designs suitable for recycling in order to pave the road for closed-loop material flows.

Fraunhofer Center for High Temperature Materials and Design HTL

Founded in 2012, the Fraunhofer Center HTL now has a permanent staff of 80. 2600 m² of high-quality laboratory and pilot plant space with state-of-the-art equipment are available for R&D projects and services. In addition, the HTL has an Application Center for Textile Fiber Ceramics in Münchberg that emerged from a cooperation between Fraunhofer and the Hof University of Applied Sciences.

The center is organized into four working groups – Composite Material Technology, Polymer Ceramics, High Temperature Design and Metal Ceramic Composites – which team up to develop materials and components or to devise measuring and simulation systems for high-temperature applications. The working groups are complemented by the Simulation and Materials Testing teams. Major R&D topics concern energy, drive-line and heat technology with a focus on improving quality as well as material and energy efficiency of industrial heating processes.

In Germany, more than 10 percent of primary energy is currently used for industrial heat treatments. There is significant potential for improvement with regard to saving costs and energy as well as for improving quality. Thermo-optical measuring (TOM) devices are developed at the Fraunhofer Center HTL for testing high temperature materials and optimizing manufacturing processes. They are used, for example for the optimization of debinding and sintering processes.

Fraunhofer Project Group Materials Recycling and Resource Strategies IWKS

The Fraunhofer Project Group Materials Recycling and Resource Strategies IWKS was founded in 2011/2012 with the financial support of the State of Hesse and the Free State of Bavaria. By 2015, the permanent staff at the Alzenau and Hanau sites combined had grown to 80. A total of 850 m² laboratory and pilot plant space is currently available. In 2012, the Application Center Resource Efficiency was created in cooperation with the Aschaffenburg University of Applied Sciences.

Against the background of ever more scarce and expensive raw materials, the Fraunhofer Project Group IWKS works to secure the long-term supply of raw materials to our industry which is a prerequisite to maintain a leading position in advanced technology. For this purpose, innovative separation, sorting and processing procedures are being researched in cooperation with industry partners, and strategies are being developed for a sustainable use of valuable resources or for substitution options. The project group is organized in six business units: Urban Mining, Electrics/Electronics, Biological Materials/Food, Magnetic Materials, Lighting, and Energy Systems.

R&D focus is on the development of regional, global as well as customized management solutions for material flows, resource efficiency and the handling of waste. Processes and technologies are systematically analyzed to design or optimize concepts for a more intelligent and sustainable use of resources.

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and

❺ Industriepark Hanau-Wolfgang
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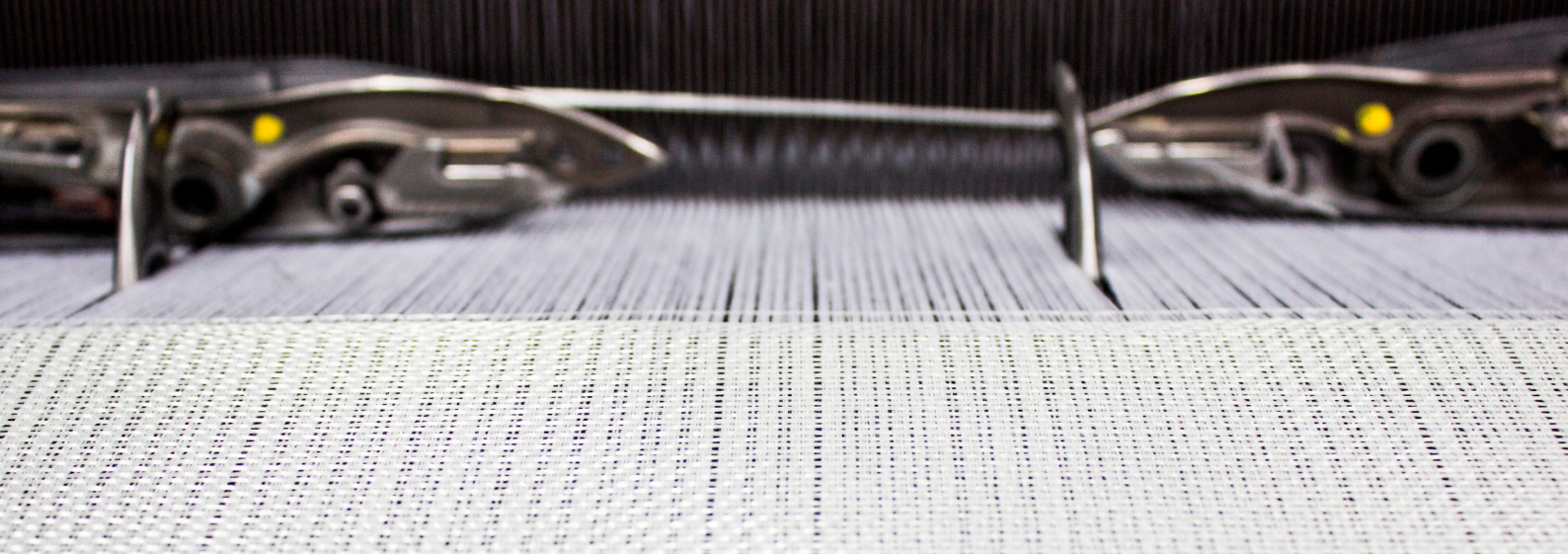

APPLICATION CENTER

FOR TEXTILE FIBER CERAMICS

PROF. DR. FRANK FICKER | ✆ +49 9281 409-4540

The Application Center for Textile Fiber Ceramics TFK in Münchberg is a joint venture of the Fraunhofer Gesellschaft and the Hof University of Applied Sciences. With Professor Frank Ficker as its director, it forms part of Fraunhofer ISC's Center for High Temperature Materials and Design HTL in Bayreuth. The merging of the expertise and know-how of the Centers HTL and TFK provides a single point of contact for all process steps from fiber development to the finished CMC-part and creates a link between textile and ceramics industries. The resulting continuous process chain is one of a kind in Europe and addresses national and international companies from all sectors, in material production and application alike.

The new Application Center researches possibilities and means to transfer well-proven textile processing techniques to the processing of ceramic fibers. This starts by testing given material for its processing suitability with just smallest sample amounts. The overall goal is to help advance the economic production of preforms for high temperature applications.

Jointly, the Centers TFK and HTL set out to optimize and produce ceramic fibers and to design textile preforms for ceramic matrix composites (CMC). The TFK's main focus is on the textile processing of ceramic fibers which are still expensive to make and hard to process owing to their fragile nature. As a brittle raw material, they require a maximum of care and caution during handling and so only allow for comparatively slow processing speeds.

The Center TFK was founded in June 2014 to assist customers in all issues relating to inorganic fibers and their textile processing. The Bavarian Ministry of Economy and Media, Engery and Technology provides a 2.5 million euros funding to help establish this regional competence center and to strenghten Bavaria's business position in the future-oriented field of "New Materials". On 4 March 2016, Bavarian State Minister Ilse Aigner personally presented the subsidy confirmation. It is the long-term goal to turn the Application Center TFK into a permanent Fraunhofer project group.

APPLICATION CENTER

RESSOURCE EFFICIENCY

PROF. DR. GESA BECK | ✆ +49 6023 32039-862

Resource efficiency is a highly relevant research area – a fact confirmed by the Horizon 2020 EU program and good reason for the Aschaffenburg University of Applied Sciences and the Fraunhofer Project Group Materials Recycling and Strategies IWKS to join forces and create an Application Center for Resource Efficiency. The Center has been granted funding by the Free State of Bavaria for a period of five years and totalling 2.5 million euros. Professor Gesa Beck was appointed scientific director in 2015. She also holds an endowed chair at the Aschaffenburg University of Applied Sciences sponsored by the municipality of Alzenau.

The Application Center engages in the development of resource-efficient functional elements, processes and products with special focus on the use of laser and nanotechnology and also electrochemical methods. Another focal area is the resource efficient design for recycling. These topics excellently supplement current research at the Fraunhofer Project Group IWKS and the University of Applied Sciences of Aschaffenburg. The following key issues are being addressed:

- Nanotechnology and electrochemical methods to improve recource efficiency in processes and products (with Prof. Dr. G. Beck in charge)
- Novel methods for material separation (with Prof. Dr. U. Bochtler in charge)
- Laser technology for recource-efficient process design (with Prof. Dr. R. Hellmann in charge)
- Substitution of critical materials and use of recycling-friendly manufacturing processes in electronics (with Prof. Dr. M. Kaloudis in charge)

Overall, the Fraunhofer Application Center is dedicated to research and development areas with a high potential for innovation and so will be an interesting partner for SME and larger companies looking to shape up in terms of resource efficiency.

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Wuppertal

ADVISORY BOARD MEETING 2015

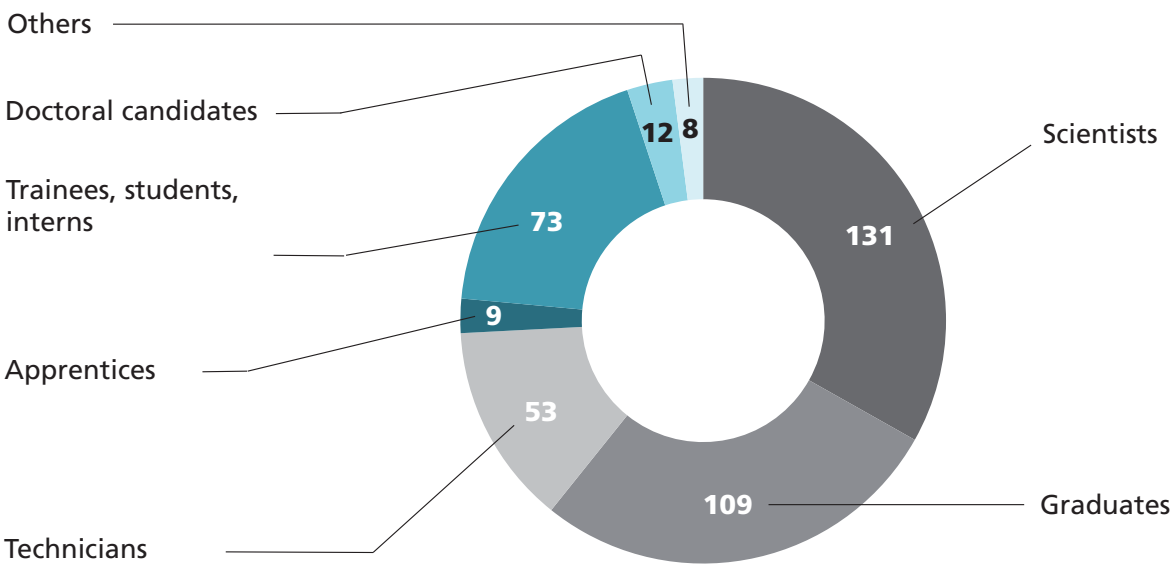
FACTS AND FIGURES

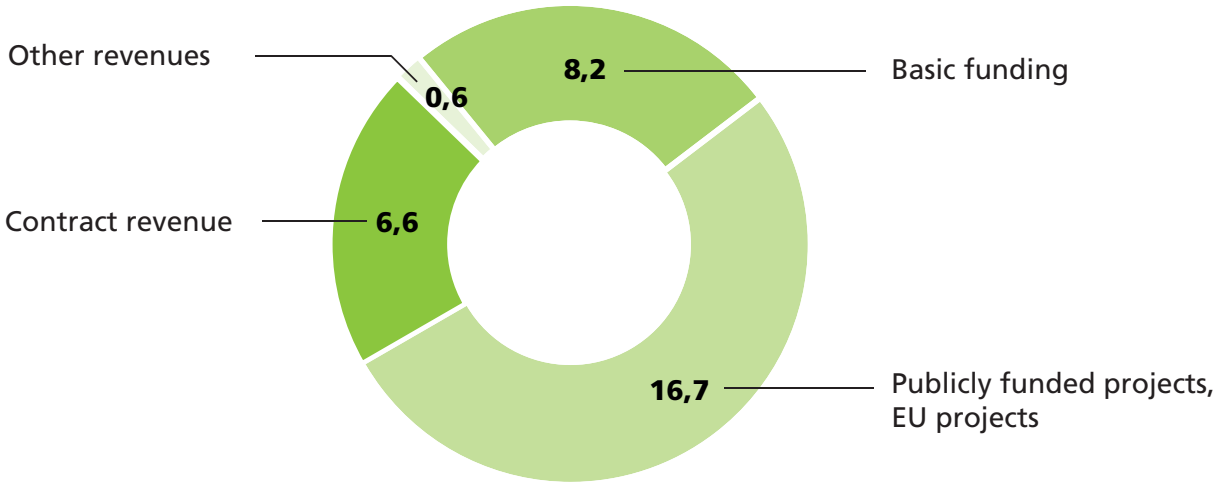
Workforce 2015				Group
Permanent staff	187	47	59	293
Scientists	64	23	44	131
Graduates	88	13	8	109
Technicians	35	11	7	53
Other staff members	58	25	19	102
Apprentices	8	0	1	9
Trainees, students, interns	40	24	9	73
Doctoral candidates (*)	6	0	6	12
others	4	1	3	8

(*) in addition to doctoral candidates at the associate Universities Würzburg, Augsburg, Darmstadt, Gießen

Personnel (head count)	395

Financing 2015				Group
Operating budget expenditure	17.4	4.9	6.7	29.0
Personnel expenses	11.7	2.7	3.8	18.2
Non-personnel expenses	5.7	2.2	2.9	10.8
Operating budget revenue	18.0	5.0	9.1	32.1
Contract revenue	5.6	0.4	0.6	6.6
Publicly funded projects, EU projects	6.7	3.9	6.1	16.7
Other revenues	0.5	0.0	0.1	0.6
Basic funding, internal programs	5.2	0.7	2.3	8.2
Capital expenditure	**0.7**	**0.6**	**4.0**	**5.3**
Capital revenue	**0.7**	**0.6**	**4.0**	**5.3**
Industrial revenue	32%	7%	8.8%	22.8%
Investment	**5.3**	**7.1**	**5.6**	**18.0**
Operating budget total expenditures (in Mio €)	**23.4**	**12.6**	**16.3**	**52.3**


Others
Doctoral candidates
Trainees, students, interns
Apprentices
Technicians
Scientists
Graduates
8
12
73
9
53
131
109


Other revenues
Contract revenue
Basic funding
Publicly funded projects, EU projects
0,6
6,6
8,2
16,7

INAUGURATION

OF NEW HTL LABORATORY BUILDING

On 28 July 2015, the Fraunhofer Center for High Temperature Materials and Design HTL celebrated the official opening of its new laboratory building at the Bayreuth-Wolfsbach site. With 2600 square meters of floor space, the building offers research facilities for a staff of 80. Its construction was financed with EU, federal and Bavarian state funds totalling 20 million euros.

The building's impressive ceramic façade visibly illustrates the research focus of the Center HTL which is on innovative, energy efficient solutions for high temperature materials and processes and lightweight construction. Energy efficiency consequently plays an important role throughout the building which features a combined heat and power unit, a geothermal heat exchanger as well as a photovoltaik system. Insulation demands according to current German Energy Saving Regulations were surpassed by over 35 percent.

With the new building, Fraunhofer HTL also expanded its technical infrastructure. Two latest generation 3D printers are now available for ceramic and metal components as well as a fully automated 450 kV computed tomography system for non-destructive material examinations, a prepreg unit for the coating of 2D fabrics and a five-axis milling machine to shape green bodies and hard materials.

The new equipment further includes several thermooptical measuring (TOM) devices especially designed to test high temperature materials and optimize their manufacturing processes. One of these devices – TOM_wave – was launched into operation by Bavarian State Minister Ilse Aigner herself during the inauguration ceremony. TOM_wave can measure the thermomechanical properties of materials at temperatures of up to 1800 °C and is the only device worldwide able to do so.

List of construction planning partners:

- **Architects:** kister scheithauer gross, architekten und stadtplaner GmbH, Leipzig
- **Structural engineering:** Suess-Staller-Schmitt Ingenieure GmbH, Gräfelfing
- **TGA planning:** ZWP Ingenieur-AG, Dresden
- **Laboratory design:** AJZ Enmgineering GmbH, Jena
- **Outdoor facilities planning:** Lösch Landschafts-architektur, Amberg

FAREWELL RECEPTION

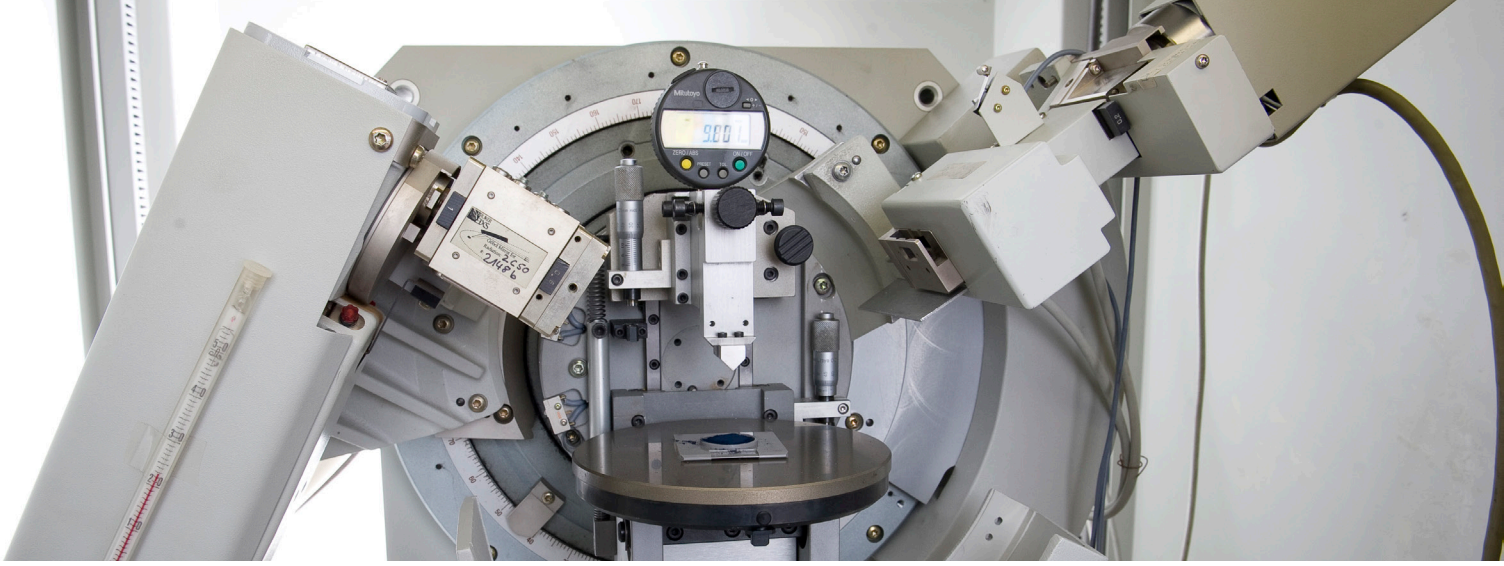
FOR FORMER DEPUTY DIRECTOR DR. ROLF OSTERTAG

On 17 July 2015, a surprise colloquium was held in honor of deputy director Dr. Rolf Ostertag on the occasion of his retirement.

Dr. Ostertag's professional career started out in 1985 when he joined the scientific staff of Fraunhofer ISC. In 1988, he opted to cross over into industrial research. He worked for Dornier GmbH / DASA at first, then moved on to the Daimler group in 1994, where he led a number of research programs on various topics over the years, including battery technology, defense, aircraft engines, process engineering, and functional materials, until he finally headed the R&D program of Mercedes Benz. In 2007, he returned to his roots in the Fraunhofer ISC as deputy director.

In charge of the strategic management, he soon began to shape the development of the Fraunhofer ISC. He initiated the founding of several centers and groups to pave the road for a sound ISC future: his flagship projects were the founding of the Fraunhofer Project Group for Materials Recycling and Resource Strategies IWKS (2011 – 2013), the Fraunhofer R&D Center for Electromobility Bavaria with the Center for Applied Electrochemistry in 2011, and in 2012 the founding of the Fraunhofer Application Center Resource Efficiency at the Aschaffenburg University of Applied Sciences. His impact reached far into the Fraunhofer Gesellschaft as a whole where he helped to introduce vital socio-political topics such as sustainability and brought about many a cooperation with industry partners. The Fraunhofer Gesellschaft honored his extraordinary achievements with the "Fraunhofer Taler" as a mark of distinction.

Sustainability was accordingly chosen to be the common denominator of talks at the farewell colloquium. All speakers were former or current co-workers, secretly invited to surprise Dr. Ostertag and see him off into retirement. So, after the welcome address from Institute Director Professor Gerhard Sextl, it was prestigious speakers like Professor Alexander Kurz from the Executive Board of the Fraunhofer Gesellschaft, Dr. Eberhard Bessey (Daimler AG), Dr. Egbert Lox (Umicore SA), Professor Rudolf Stauber (Executive Manager of the Project Group IWKS), Dr. Johanna Leissner (Fraunhofer Representative in Brussels), Dr. Henning Lorrmann (Head of the Center for Applied Electrochemistry) and Dieter Sporn (then Head of the Center Smart Materials CeSMa) who seized the opportunity to honor him with scientific talks and add their personal farewell messages.



ACCOMPANYING ANALYSIS PROCESSES

ALONG THE VALUE-ADDED CHAIN

DR. JÜRGEN MEINHARDT | ☽ +49 931 4100-202 | juergen.meinhardt@isc.fraunhofer.de

The Fraunhofer ISC group is in the position to offer customers and project partners all materials analyses required along the value-added chain up to the finished product. On demand, customized tools to support or optimize process control can be developed and built as well as special measuring systems such as the thermooptical measuring devices TOM with high precision optical dilatometers or instruments for the efficient and reliable calibration of volume measuring devices like chemical lab pipettes.

Individual ISC sites focus on different analysis tasks:

Würzburg | Bronnbach sites (ISC parent institute)

Damage analyses and quality control of production processes. Other areas of expertise include analyses of environmental impacts on materials (corrosion and lifetime testing), battery analyses (e.g. postmortem analysis), as well as life science analytics.

Bayreuth site (Fraunhofer Center HTL)

Analyses of heat treatment processes and material characterization at high temperatures. Other areas of expertise include non-destructive and mechanical materials testing.

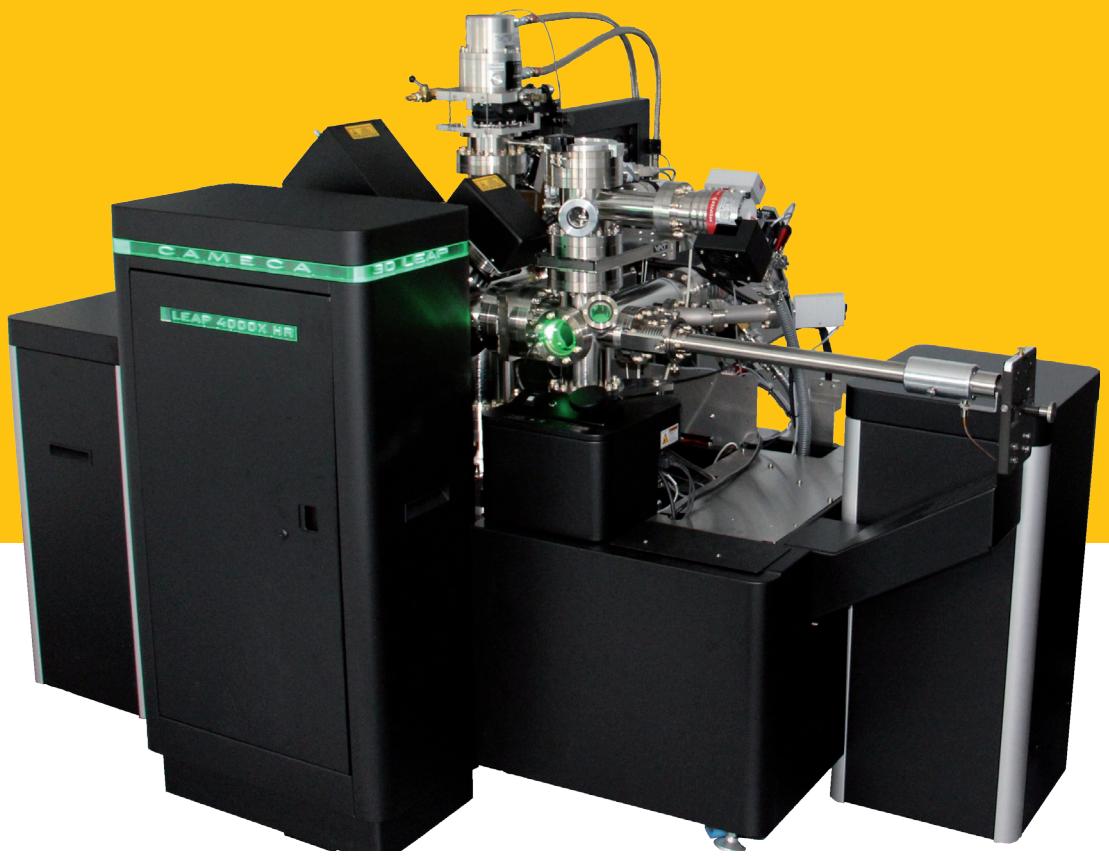
Alzenau | Hanau sites (Project Group IWKS)

Recycling process analyses. Other areas of expertise include analyses of magnetic materials and of materials containing rare-earth elements.

Given the manifold analysis tasks along value-added chains, the ISC group holds a vast array of analysis tools and methods available over all sites:

I. Chemical and structure analysis

- Near artefact-free ion beam preparation of all sample materials and composites for subsequent high resolution analysis
- High resolution (cryo) scanning electron microscopy incl. electron backscatter diffraction (EBSD) and 3D FIB tomography
- Atomic-resolution scanning transmisson electron microscopy for structure determination
- Atomic-resolution chemical 3D interface analysis (atom probe microscopy)
- X-ray diffraction methods/structure analysis (high temperature and in situ XRD investigations)
- Chemical surface/coating analysis, e.g. X-ray photoelectron spectroscopy, micro-, infrared- and micro-Raman spectroscopy incl. laser scanning microscopy for quantitative analyses of surface topography
- Post-mortem analysis to investigate the aging of batteries
- Wet chemical elemental analysis with ICP-OES (incl. hydrofluoric acid digestion) and laser ICP-MS
- Life science analyses, e.g. of biological samples (like live cells) with environmental scanning electron microscope or with 3D confocal fluorescence microscope



- Non-destructive testing methods, e.g. thermal imaging, X-ray computed tomography or terahertz technology, to investigate interior structures of components at macroscopic scale and, where necessary, localize defects
- Chemical gas analysis, i.e. chromatography incl. HPLC, HPIC, and GC-MS

II. Process analysis

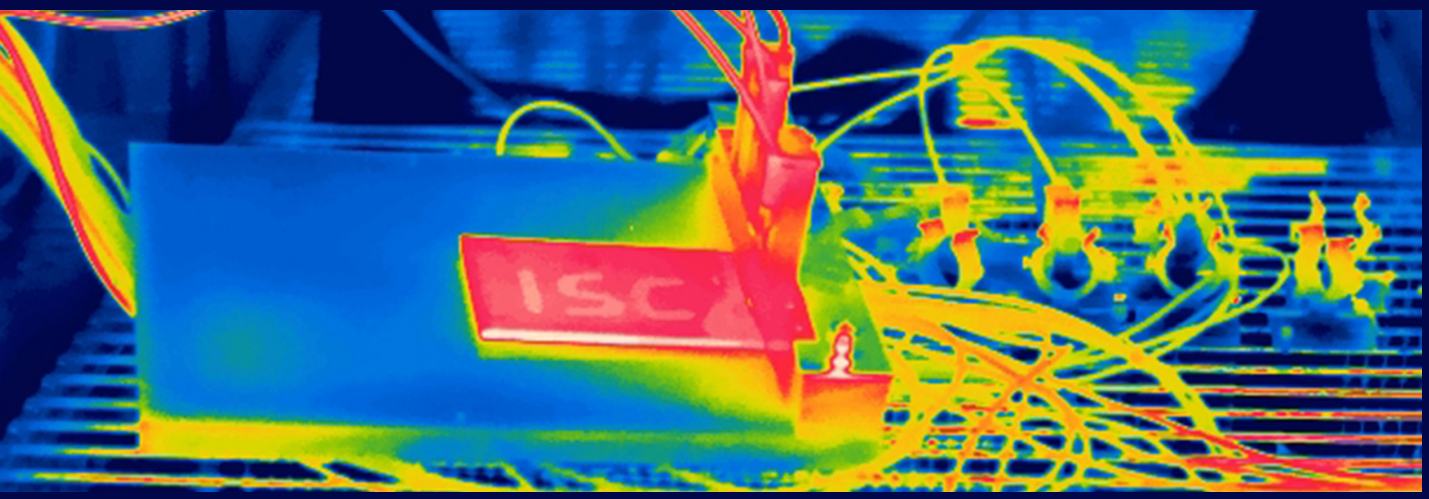
- Thermal analysis
- Thermooptical measuring devices (TOM) for use at high temperatures, e.g. to measure dimensional changes, mass loss, thermal conductivity, viscosity, wetting, corrosion etc.

III. Characterization analysis

- Mechanical test methods, also available for specific issues e.g. occurring in dental applications
- Optical test methods, e.g. stress analysis
- Scanning electron microscope laboratory for characterizations at the microscale, e.g. to determine electric conductivity
- Battery testing
- Determination of magnetic properties (PPMS, VSM, Kerr microscope)
- Environmental monitoring with glass sensors and materials testing under variable climate conditions, e.g. with KLIMATOM
- Cell-based assays – test environments for the analysis and evaluation of active subtances in drugs.

The wide range of test methods available within the ISC group makes sure that answers will be given to every question a customer may have. The Center for Applied Analytics in Würzburg is accredited according to DIN EN ISO / IEC 17025, the Center HTL in Bayreuth is certified according to DIN EN ISO 9001.

Central point of contact for analysis-related matters is the Center for Applied Analytics at the Würzburg site. Customer inquiries will be forwarded to the person in charge of the problem at hand.



THERMAL MANAGEMENT

MATERIALS – PROCESSES – ANALYSES

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In Germany, heating and cooling equipments, with process heat and air conditioning, account for the major part of energy consumption and drive up CO_2 emission and costs. An intelligent thermal management can raise efficiency, save energy costs and reduce the emission of greenhouse gases.

Fraunhofer ISC, along with its Hanau and Alzenau based Project Group IWKS and the Fraunhofer Center HTL, works to offer customized thermal management solutions that cover it all: novel temperature resistant materials, target applications in engineering and air conditioning, as well as optimized high temperature processes. R&D projects are backed up by process simulation, sophisticated measuring techniques, thorough analyses and extensive consulting know-how.

Here is a short summary of the materials and services provided by Fraunhofer ISC in terms of more efficient space conditioning and thermal management of combustion, cooling, and manufacturing processes:

Space conditioning solutions

A novel highly porous glass material developed by Fraunhofer ISC as additive to inner plasters or interior wall paints regulates indoor humidity and also provides a beneficial effect on the room temperature. Fraunhofer ISC also works to improve refractory insulation materials.

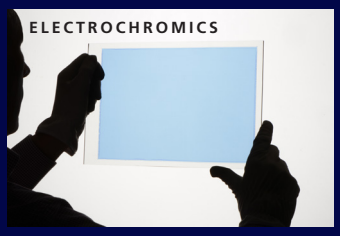
Another recent ISC development provides uncomplicated solutions for electrochromic windows in cars and buildings. A new class of material expands the selection of tint shades.

Phase change materials store or release energy when changing from solid to liquid or vice versa. Fraunhofer ISC offers encapsulated phase change materials for different temperature ranges.

Most cooling processes rely on the use of compressors. The principle of magnetic cooling opens up new pathways towards an energy-efficient cooling technology and is a research topic at the Hanau site of the Project Group IWKS.

Engineering solutions

Operating temperatures in power generating wind turbines can well exceed 100 °C, depending on the technical design. This affords special temperature resistant magnetic materials which contain additives selected from the rare earth elements such as dysprosium. Rare earth elements have been subject to strong price fluctuations due to the monopoly position of a sole supplying country. The Project Group IWKS at Hanau and Alzenau therefore works to develop high-temperature resistant magentic materials that require just smallest amounts of rare earth metals or even none at all. IWKS research is also concerned with the efficient recycling of rare earth elements or alloys from used magnets.



High temperature process solutions

Aircraft turbines could work more efficiently if the usable temperature range of combustion gas could be extended but there is a limit to the temperature resistance of metallic materials. For temperatures beyond, the only available materials are fiber-reinforced ceramics as developed at the Fraunhofer Center HTL in Bayreuth.

These high temperature resistant composite materials are also suitable for use in industrial furnaces and kilns. Their high stability allows lightweight constructions of firing racks. With those, less energy is needed for heating up.

In industrial heat treatment, the choice of material is not the only way to improve energy efficiency. It is equally important to optimize the actual heat process itself. Based on simulation calculations, the Center HTL has already succeeded in lowering the energy consumption of a given firing process by up to 40 percent.

The Center HTL is presently expanding its product range from ceramic to metal and metal-ceramic composite materials. The researchers base their development work on simulations of the structure property relations of these new materials.

Measuring and analysis solutions

Exact knowledge of a material's behavior under load at temperatures of over 2000 °C and under freely adjustable gas atmospheres and pressures is a prerequisite to control heat processes and to successfully develop target materials. This is where the thermooptical measuring devices TOM come into play.

Whether developed for in-house purposes or on customer demand, TOM devices now cover a broad range of measuring tasks in all kinds of industries, from watch making to power supply.

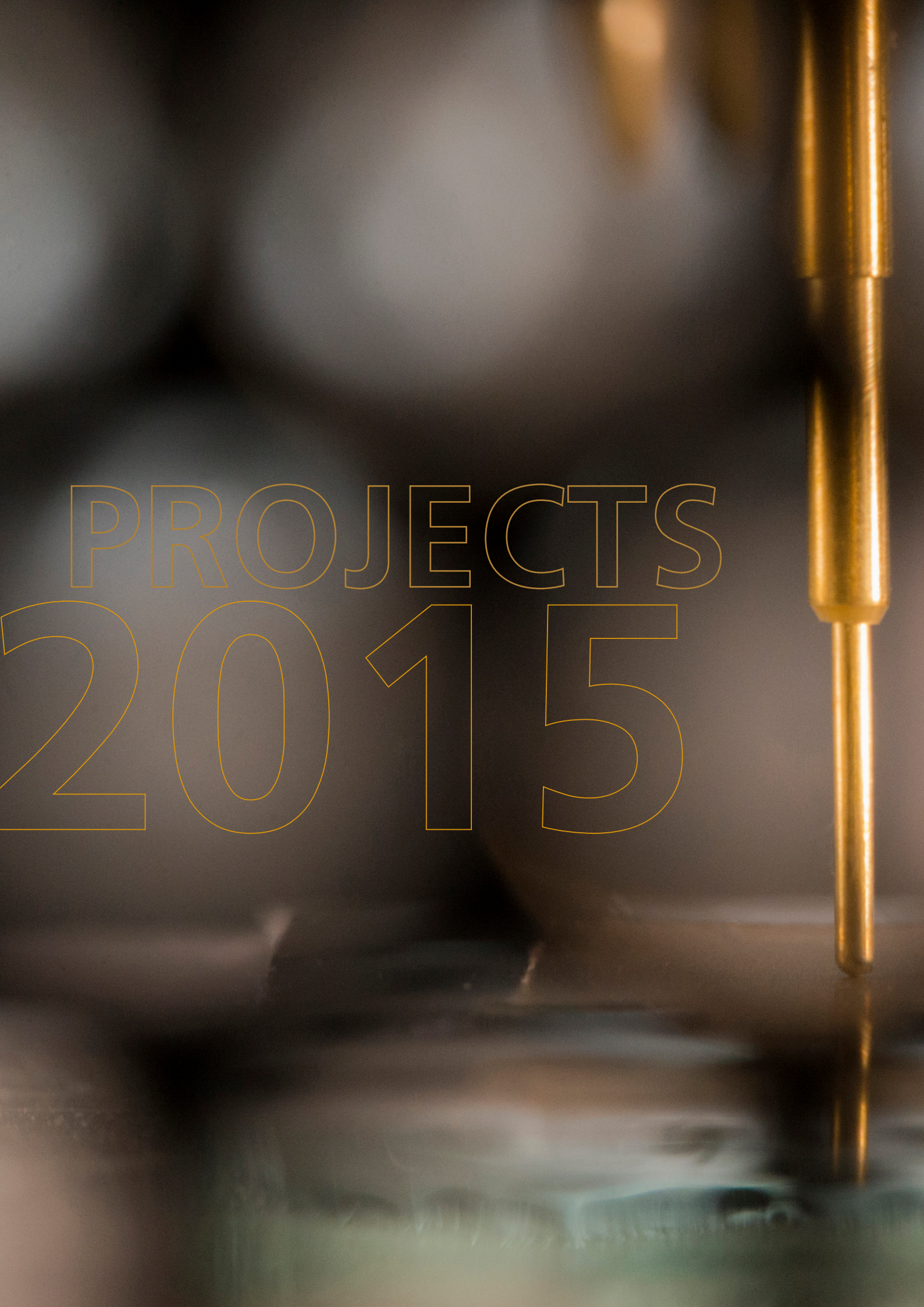
The latest member of the TOM family enables the optical tracking of degradation processes at temperatures from -70 °C to +180 °C in different humidity ranges (KLIMATOM). Tested materials include concrete as well as plastics.

The thermal conductivity of substances is not necessarily linear with rising temperatures. A special measuring tool was developed to easily monitor the precise thermal conductivity of a given material at any point from room temperature to over 1000 °C.

The self-designed tools and devices are complemented by a vast array of other measuring instruments, including a thermal image camera with high levels of temporal and spatial resolution.

Insulating materials based on glass and mineral fibers have been state of the art for many years. Fraunhofer ISC has one of only a few analysis laboratories in Europe accredited to test and certify the health safety of fiber materials for compliance to RAL/EUCEB requirements.

Fraunhofer ISC also offers to test the insulating effect of given fiber insulation products.


PROJECTS
2015

MINSEM

RECOVERY OF RARE EARTH ELEMENTS

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With the Fraunhofer Project Group IWKS as coordinator, a consortium of seven partners from research institutes and industry launched the MinSEM project for the recovery of rare earth elements and platinum group metals in June 2015. The project is funded by the Federal Ministry of Education and Research (BMBF).

The aim is to recover rare earths and metals from slags produced by the recycling of exhaust gas catalysts and from residues occurring in the production of flint glasses.

Today's technical-scale recycling of exhaust gas catalysts produces large amounts of smelting residues (slags) which contain precious metals and rare earths that are hard to come by. The residues occurring in flint glass production also contain important amounts of rare earth elements, in particular lanthanum.

None of these are currently recovered for the simple reason that there are no adequate recovery processes all the way from crushing to extraction and re-use. The MinSEM project team is looking to amend this. Their aim goes beyond the mere extraction of the target elements. To close materials cycles, they want to ensure their re-use.

Still, the first focus is on the development and implementation of eco-friendly recycling processes that allow a selective separation of all materials fractions along with the extraction of the target metals and so create the least possible amount of waste. Several approaches are under investigation, such as acid treatment, use of ionic fluids or gas phase reactions.

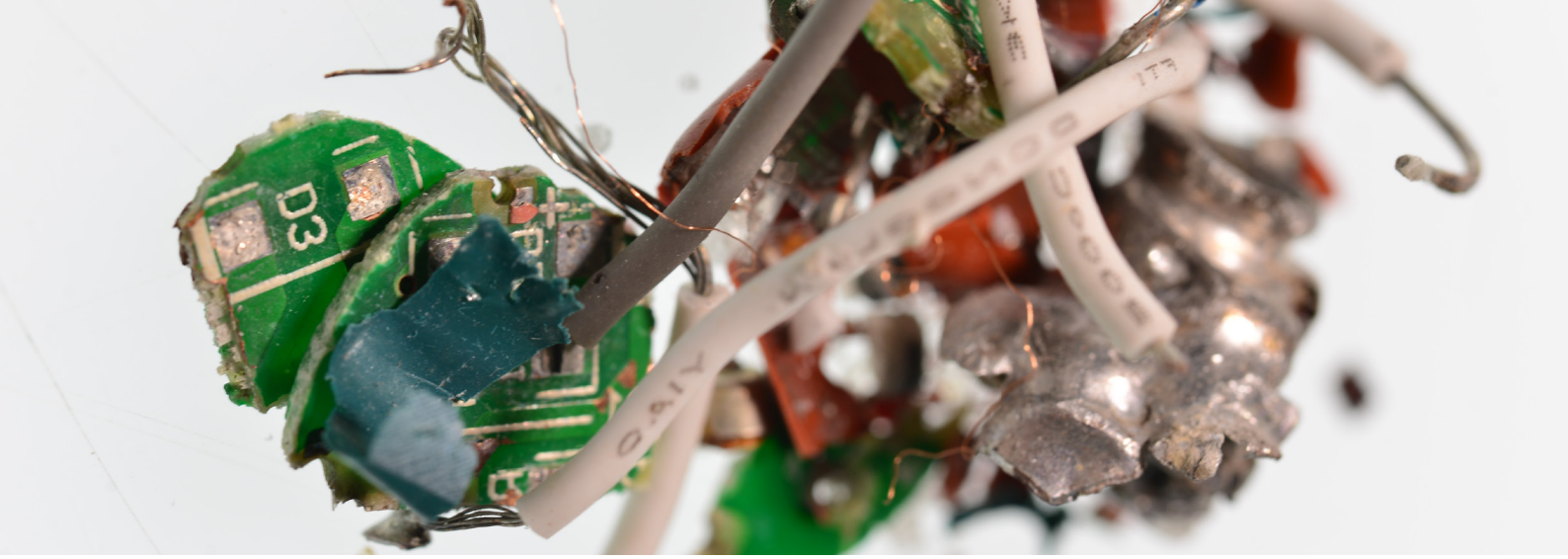
The recovered rare earths are destined for use in the production of specialty glass and high tech products. Recovered platinum group metals might play a part in the catalyst or electronics industry. Good use of the glass fraction is feasible in road construction. Even the remaining mineral residual fraction can be of use as secondary product in the building materials sector.

Upon completion of lab-scale testing, the MinSEM team will scale up all processes to pilot level in order to advance the market potential.

This project receives funding from the Federal Ministry of Education and Research within the framework of the "r^4" program ("Innovative Technologien für Ressourceneffizienz – Forschung zur Bereitstellung wirtschaftsstrategischer Rohstoffe").

GEFÖRDERT VOM

Bundesministerium für Bildung und Forschung



RECYCLING LED LAMPS

THINK OF TOMORROW TODAY

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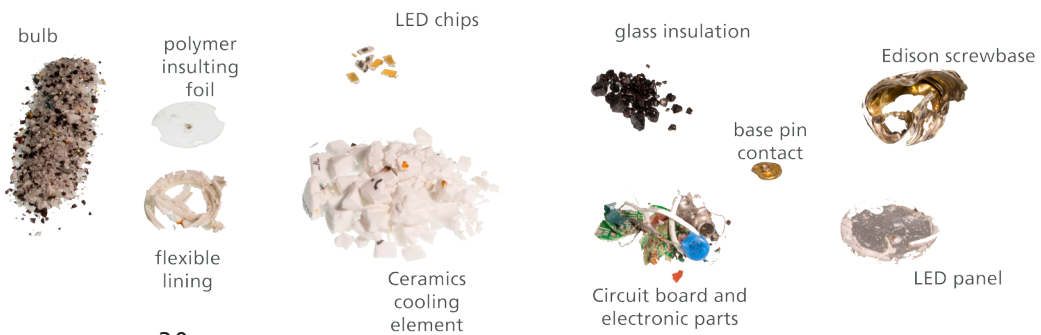
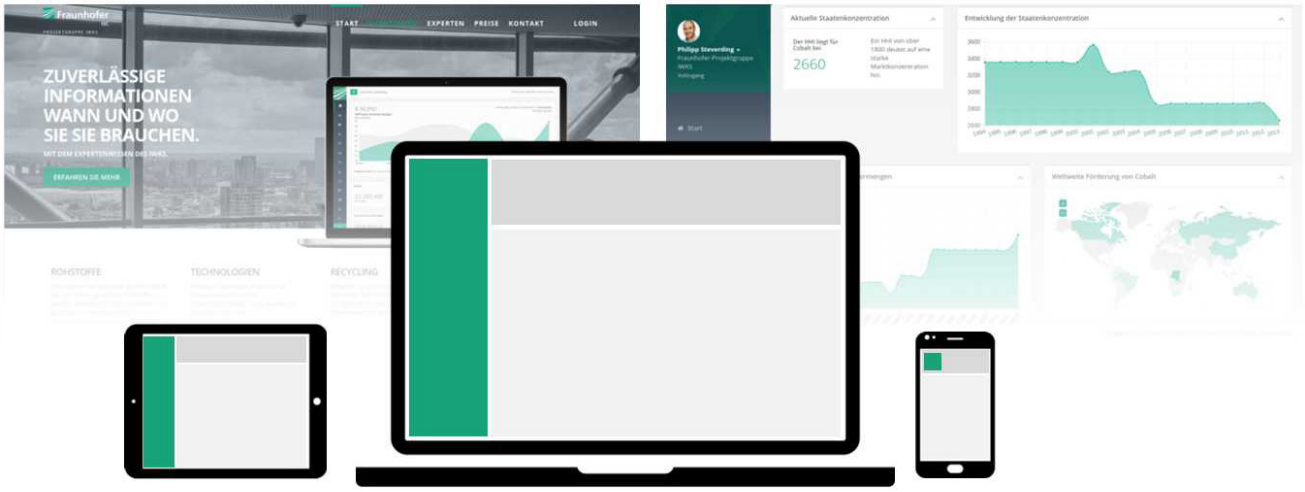
When the EU commission decided to ban inefficient light bulbs, the lighting landscape began to change. One of the effects is a noticeable shift toward LED lamps. According to the German Energy Agency, they have already gained a market share of seven percent. LED lighting is forecast to surge within the next five to ten years.

Since LEDs have long service lives and their use is only just beginning to spread, they make up no more than one percent of waste bulbs so far. This is the reason why recyclers are still focusing on glow-discharge lamps. There are currently no industrial processes available for the recycling of waste LEDs.

This is where the Fraunhofer Project Group IWKS is looking ahead. Its electro-hydraulic method of crushing LED retrofit lamps has created an efficient way to separate and sort individual materials and components by type (see illustration below). The method goes beyond the recovery of metal, plastic, glass, and electronic waste in clean material fractions, for it even allows to separate and retrieve the actual LED components from the circuit board.

The IWKS Project Group is also working to develop processes for the recovery of the functional materials used in LEDs: gallium and indium in diodes, gold and silver in contact systems, and rare earth components such as yttrium, lutetium, cerium or europium in LED phosphors. Contained amounts are very small so that their recycling does not yet appear to be of economic importance. But this will change with growing demand and given the criticality of these elements.





ATLAS – INFORMATION SYSTEM ON RAW MATERIALS RELATED RISKS

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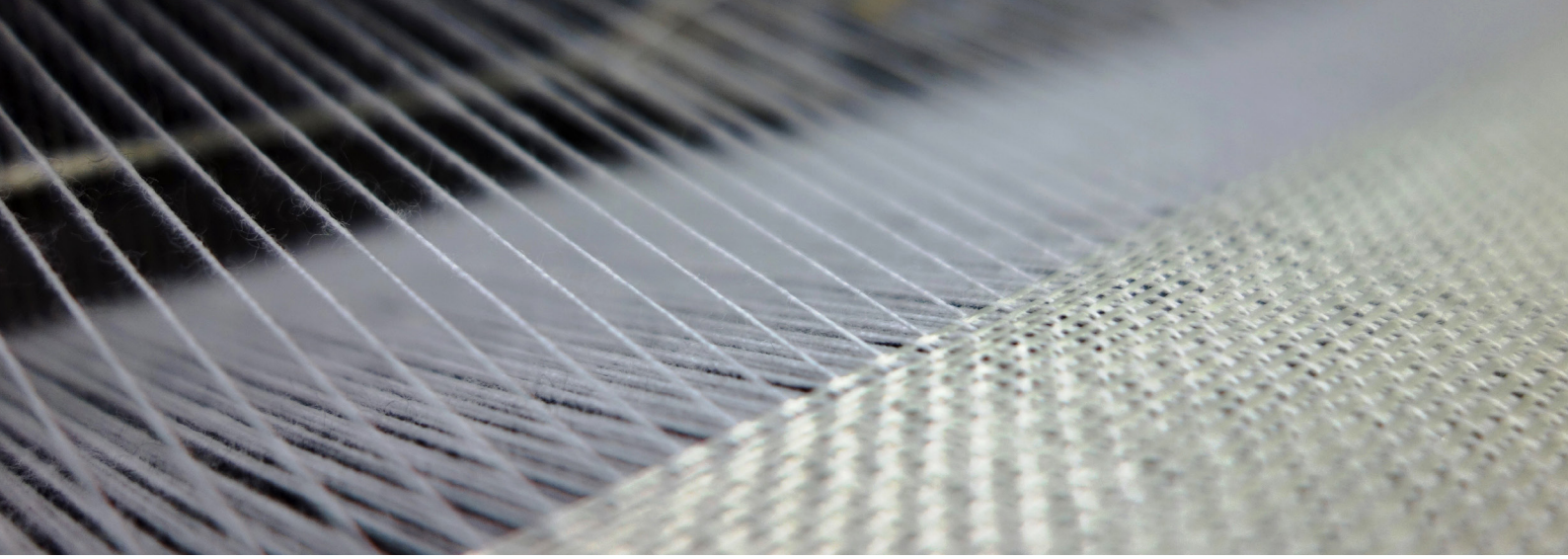
The composition of modern industrial goods tends to be highly complex. The value-added chains leading up to the manifold materials and components joined together in the final product are no less complex. Manufacturers may not even be aware of the risks along their value-added chains through integration of more and more components. An effective risk management relies on independent, up-to-date information and current data on the raw materials situation across the world, not least to identify impending shortages and prevent unexpected extra cost. It is vital to assess and minimize raw materials related risks.

The ATLAS project of the Fraunhofer Project Group IWKS is providing just that: A constantly updated information system for manufacturers working with complex value-added chains and depending on the reliable availability of critical raw materials. ATLAS compiles latest information on supply situations for individual raw materials to help manufacturers, large-scale or SME, evaluate and decrease their raw-materials related risks.

ATLAS customers have direct access to this information and so save labor and equipment costs for self-organized research. What's more, the information is targeted and edited and comes complete with expert analyses in an objective manner. Interactive presentations facilitate the reader's interpretation and, should the case arise, one will also find alternative solutions to substitute materials with either recycled or less critical ones.

The development of the ATLAS system is in full swing and passed the proof of concept. The IWKS divison "Resource Strategies" has received major support from the Fraunhofer Gesellschaft within the framework of the FDays Venture Program. A close cooperation with industry partners ensures constant adaptation to the actual information needs of manufacturing companies.



TEXTILE PROCESSING

OF INORGANIC FIBERS

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The textile processing of inorganic or ceramic fibers involves the adaptation of conventional textile processing techniques to the particular requirements of inorganic materials. This is where the Application Center Textile Fiber Ceramics TFK of the Fraunhofer Center HTL and the Hof University of Applied Sciences comes into play. Their first step is a thorough evaluation of the textile processing potential of the material in question. Later, in actual weaving, it is, for instance, important to avoid small radii and twisting when feeding the fibers, whether in weft (crosswise) or warp (lengthwise) direction. As ceramic rovings are flat and ribbon-shaped, twisting around their own axis would significantly impair both appearance and relevant properties.

A closer look at the challenges contained in the weaving process reveals that they occur at four different machine positions: at warp feeding, at the heddles, at weft insertion and weft supply. Weft and warp finally make up the woven fabric.

Warp feeding

Warp feeding must meet a number of requirements. For example, the tension of all warp threads must be even and the same at all times and threads must never be too slack. This is usually ensured by a certain elasticity but ceramic rovings do not stretch and that must be accounted for.

Heddles

Each warp thread has to pass a heddle. The raising and lowering of the heddles follows a preselected pattern to create the so-called shed. The heddles must be adapted to the delicate material which needs to be threaded through the heddle eyelet. In this eyelet, the roving is guided upward or downward perpendicular to its longitudinal axis. Robust standard yarns do not suffer any damage while passing the eyelet. For ceramic rovings, however, it takes some multistep testing to choose the best suitable kind of heddle over a regular one.

Weft insertion

Raising and lowering of the warp threads creates a passage for the weft threads. Several insertion techniques are available. Insertion by rapiers appears to be the most advantageous for ceramic rovings. Material handling is gentle, and acceleration and deceleration at the selvage edges are not as abrupt as e.g. in insertion by projectiles.

Feeding of rovings

A second challenge in weft insertion is that rovings must be supplied without any twisting. Usually, yarn is held available on a weft feeder drum and drawn off when needed. But this method perforce generates twisting. In standard applications, this will not be much of a problem but ribbon-shaped high performance fibers must have no twists. Several alternatives are therefore under investigation which do not provide rovings on drums but in loops.

Other research includes web formation and braiding of rovings.

NEW THERMOOPTICAL MEASURING METHOD FOR REFRACTORY MATERIALS

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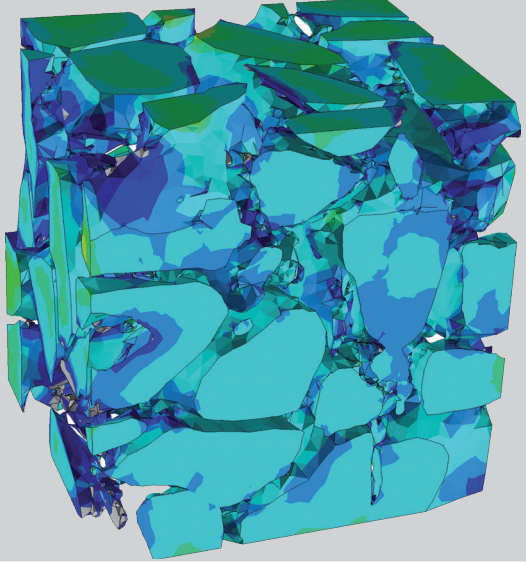
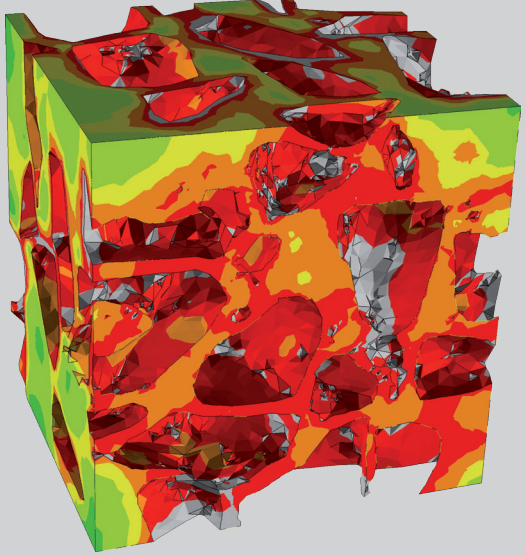
Materials destined for high temperature applications – e.g. in power plants, drive technology, or in ceramics and glass production – must also undergo heat treatment processes during their fabrication. The optimum control of these processes decides on a material's reliability and energy efficiency during later use.

Within the framework of the project cluster EnerTherm, funded by the state of Bavaria, the Fraunhofer Center for High Temperature Materials and Design HTL is working to continuously refine and advance relevant methods, thermo-optical measuring devices and structure simulation calculations to gain more insight into heat treatment processes and better control.

The new thermo-optical measuring device TOM_wave, for example, was developed to characterize refractories under near reality conditions. Previously, samples were only cooled down by sudden thermal shock per DIN EN 993-11 from high temperatures like 950° C to room temperature and the resulting damage was analyzed. Damage due to partial shock heating was not taken into account even though it does occur under real conditions, for example when introducing hot melts. TOM_wave now allows to induce thermal stress in a test sample by laser while parameters like expansion, temperature, heat conduction and acoustic emission (due to crack formation) are measured on line. It is also possible to examine thermal cyclization. Simulations correlated to the gained data reveal suitable approaches to improve the quality and reliability of refractory materials, to optimize their manufacturing processes, and to render lifetime prognoses more precise.

Other application areas for TOM systems include the investigation of corrosion processes under hot and extremely aggressive conditions, as, for example, prevailing in gas turbines. TOM_chem is presently developed to test corrosion resistance in variable, controlled gas atmospheres with high volume flows at temperatures of up to 1500° C. TOM_chem will offer the unique possibility to introduce dust, particles or vapours into the gas flow as required to analyze corrosion problems under near operating conditions. And TOM_pyr enables a better analysis and thus optimization of debinding processes. Further TOM systems are available for other characterization purposes or can be developed on demand for special measuring needs of customers.





MICROSTRUCTURE SIMULATIONS

HELP OPTIMIZE HIGH TEMPERATURE MATERIALS

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Only correctly tailored and matched material properties will provide composite materials with just the characteristics required for their destined application and industrial processing. The Fraunhofer Center for High Temperature Materials and Design HTL has developed and empirically validated simulation tools to computationally select well-matched starting materials and designs to ensure reliable structure-property correlations in multiphase systems. Simulations now minimize tedious and material consuming experiments on the way to a new product.

To successfully predict the final properties of a composite, it is not enough to know the parameters of the individual component materials. The characteristic geometric data of the resulting structure is of equal importance. For this reason, Fraunhofer HTL developed the GeoVal software. It is able to flexibly generate all kinds of different microstructures for ceramics made from powder precursors. Quantitative comparison, e.g. by electron microscopy analysis, ensures that the representative volume elements (RVE) generated by GeoVal really correspond with the actual structure to the best possible extent. With the RVE structure as a starting point, finite element simulation is used to determine the macroscopic properties of the resulting composite.

Following experimental validation, individual parameters like grain size and phase fractions can be varied in simulation until the optimum composition is found for the target application. Special focus is on the detection of internal strain due to deviating thermal expansion of individual components. Again, simulations offer excellent clues as to which kind of structure will result in the highest intrinsic strength. They can also help determine the right amount of additives – for example of conductive components required to render the material suitable for electric discharge machining.

The overall concept of microstructure property simulations was developed in a number of doctoral projects and has since been put to test in the development of composites based on silicon nitride, aluminum nitride or silicone carbid. The method is presently being evaluated for use in the development of fiber composites, also by deriving the structural data directly from computed tomography imaging.

CO-PILOT

FUNCTIONAL NANOCOMPOSITES À LA CARTE

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With their tunable properties, nanoparticles offer fantastic opportunities to refine a wide variety of materials for technical use. It is still quite a challenge, however, to synthesize large amounts of nanoparticles by bottom-up wet chemical approaches in a way to obtain individual particles for further processing. But this is a prerequisite to really benefit from nano properties.

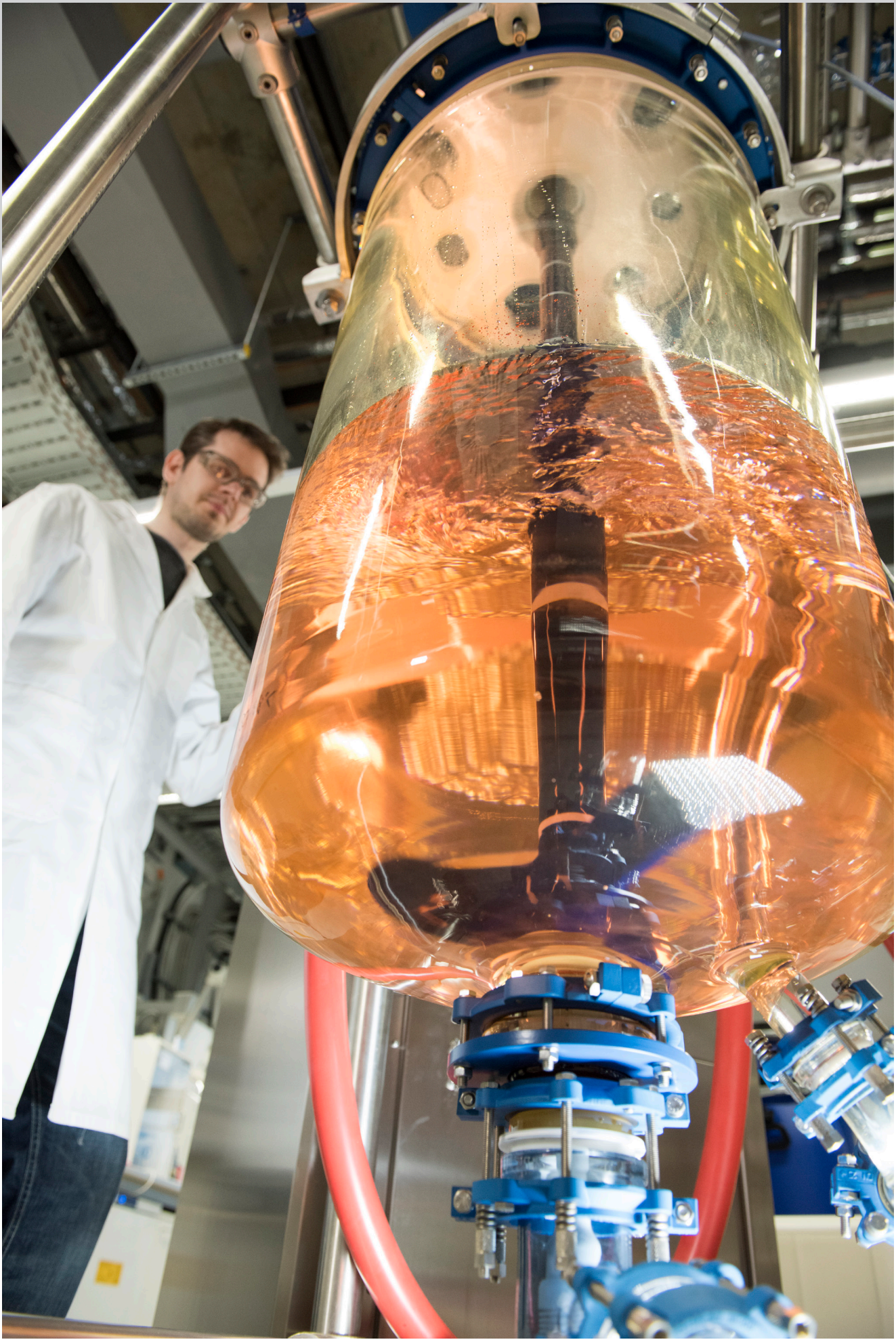
Within the framework of the EU funded project CO-PILOT ("Flexible Pilot Scale Manufacturing of Cost-Effective Nanocomposites through Tailored Precision Nanoparticles in Dispersion"), which was launched in 2015, a consortium of industry and research organisations including Fraunhofer ISC is working to establish a new service solution for the upscaling of nanoparticles in dispersion and the manufacturing of nanocomposites. The aim is to provide a top-of-the-notch open-access infrastructure for small and medium sized enterprises interested in the production of high-quality (multi-)functional nanocomposites on a pilot scale.

The task assigned to the research team around Dr. Karl Mandel, head of Particle Technology at Fraunhofer ISC, is to set up corresponding synthesis plants and to scale up the manufacturing of nanoparticles to batches of up to 100 liters and 200 kilograms respectively. For this, the researchers work with a number of different reactor designs, all complete with analytical instruments which allow a precise control and targeted modulation of the synthesis process. An innovative semi-continuous centrifuge – which will be turned into a one-of-a-kind top performance prototype by project partner CEPA during the course of the project – enables the efficient purification of the particles so they can then be modified and incorporated into composites.

Four different model systems were selected to demonstrate the maximum variability and flexibility for the pilot production of particle systems and composites. These include double layered hydroxides applicable in flame inhibiting fillers, hollow silica particles destined for anti-glare coatings, semi-conducting titanium and zinc dioxide nanoparticles for high refractive index composites as used in high-voltage insulator applications, and magnetic nanoparticles suitable for separation functions in the field of catalysis or waste water cleaning.

- PILOT
Navigates you through nanocomposites

This project receives funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 645993.



PHOTOCATALYTIC NANOPARTICLES
AGAINST CANCER

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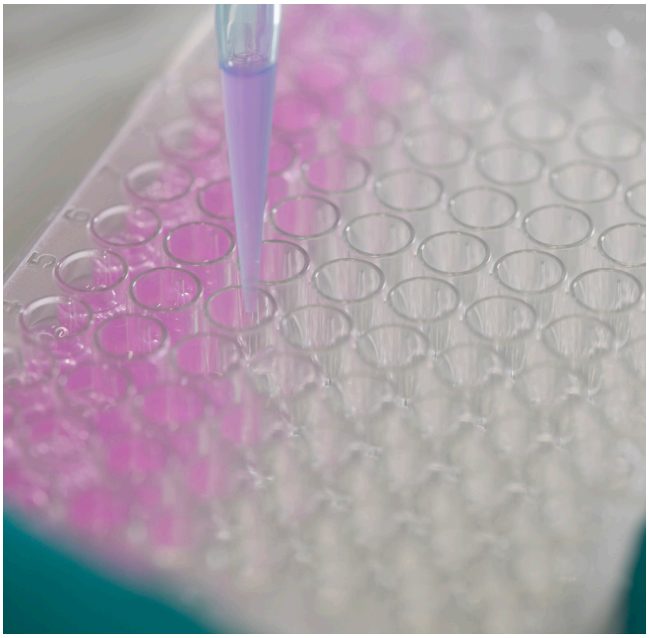
Most tumor diseases are initially treated conservatively by surgical resection in combination with radiotherapy and/or chemotherapy. Special problems arise when mucosal areas are affected. Despite enormous progress in today's cancer research, many patients still experience serious adverse events during their treatment. Fraunhofer ISC joined forces with the Translational Center for "Regenerative Therapies for Oncology and Musculoskeletal Diseases", the ENT Department of the University Clinic Würzburg, and the University Bordeaux to develop a novel therapy approach based on photocatalytically active titanium dioxide nanoparticles (ORMOBEAD® p-cat).

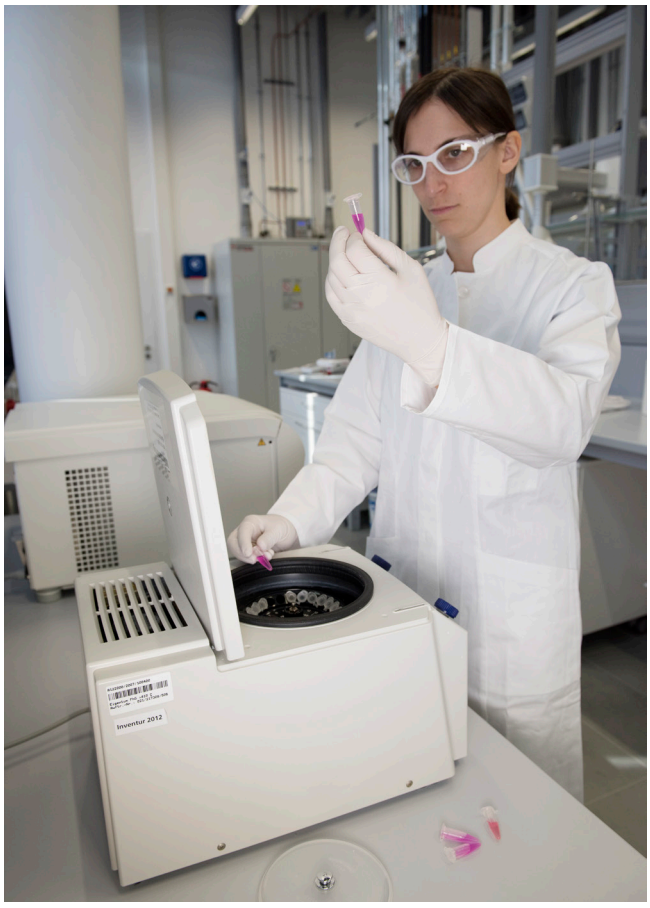
These particles designed by Fraunhofer ISC have a size of 5 to 25 nm and a very special surface. The aim is to treat the second most common form of skin cancer – the head and neck squamous-cell carcinoma affecting the mucosal surfaces inside the mouth, the nose, and the throat. A distinctive feature of this kind of tumor is the so-called field cancerization: The cancer does not grow into deeper layers but spreads over large areas of the mucosa so that surgery is unlikely to be effective.

An in vitro pretreatment with UV radiation activates the ORMOBEAD® p-cat nanoparticles. Once activated, they have a cytotoxic effect on tumor cells while healthy cells remain intact. The fact that the activation process takes place in vitro and not in the patient where UV light would be harmful is among the many advantages of this approach.

The project partners in Würzburg and Bordeaux are now optimizing the particle surface stabilization for better uptake by the cells and strive to gain further insight into the involved biological processes like cell uptake mechanisms, growth inhibitation and cytotoxic effects on the tumor cell.

This project is funded within the framework of the EU program "COST ACTION", the Fraunhofer "TALENTA" program and by the University Bordeaux.




Inventur 2012

WEARABLE TECHNOLOGY –
SMART PRINTED SENSORS TO MONITOR BODY MOVEMENT SEQUENCES

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Today, bracelets can take over health coach functions, helping the bearer to provide for sufficient sleep and activity or a healthy diet. Sensor-embedded textile solutions are a far more challenging and also more expensive approach. The research team around Gerhard Domann, head of Optics and Electronics at the Fraunhofer ISC, has developed a new transparent sensor material suitable for simple printing onto textiles and destined for the monitoring of body movement sequences.

As proof-of-concept, the new sensor technology is presently being incorporated into a prototype shirt. To develop the so-called MONI shirt, Fraunhofer ISC joined forces with Fraunhofer ISIT. In an initial step, Fraunhofer ISC developed novel piezoelectric polymer sensor printing pastes free from toxic solvents while Fraunhofer ISIT provided the evaluation electronics.

The new sensor materials register pressure and deformation and so can serve to track movement sequences. Their sensitivity to temperature further enables non-contact or proximity interaction. A simple screen printing process, suitable for low-cost mass production, is all it takes to apply the sensor pastes onto the textiles. The sensors are transparent and flexible and do not interfere with any given textile design. Since they are much thinner than a hair, they will hardly be noticed by the garment wearer. Also, the sensors do not require any power source like a battery. Instead, they harvest all the energy they need.

Smart textiles like this could be employed to monitor the mobility of elderly people in everyday life by registering their movement sequences. In hospitals, it would be possible to monitor body signals of in-patients, such as temperature or breathing. This could be especially beneficial for bedridden patients or babies. One day, functional sensor clothing could contribute to affordable health care by facilitating or assuming respective tasks in patient care.

Next development steps will include field tests on several types of textiles and applications as well as wear and washability tests.


TRANSPARENT
PRINTED SENSORS

HUMAN-MACHINE INTERFACES –
SWITCHLESS CONTROL ELEMENTS

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Innovative smart materials lead to novel applications and freedom of design in the automotive sector. Holger Böse and his team of researchers from the Center Smart Materials CeSMa are developing sensors and actuators made of silicone whose properties can be controlled by application of electric or magnetic fields. The project is funded by the Bavarian Ministry of Economic Affairs and Media, Energy and Technology.

Soft pressure sensors made of conductive and non-conductive silicones are rapidly gaining importance. Processed into gloves, they measure the gripping force of the user, e.g. to monitor loads lifted by workers who have to move heavy objects. In gripping tools of robot arms they help measure the gripping force applied to a part. Sensors like this are also attractive to the automotive industry. Integrated into steering wheels, they enable a more flexible control of settings: Radio volume or ventilation rate can easily and steplessly be adjusted by varying the pressure of a fingertip onto the sensor. Up to now, switches were made of rigid plastic, ceramic or metal materials. Their lack of flexibility prevented total integration and often limited functions to mere "on/off" or "forward/backward" choices.

The CeSMa sensors, however, are comprised of several silicone components that carry electrodes to measure capacity changes between them. A system's sensitivity relies on the shape and position of its electrodes as the capacity – the measure for pressure – is different in every design. The ISC researchers exploit these differences and adapt sensor designs to target requirements. CeSMa has developed its own formula for the production of silicone but also reverts to commercially available precursors. Both composition and sensor shape are tailor-made for every application to meet specific customer demands.

The next step following the proof of concept will transfer the technology from lab to product. The automotive realm offers wide application potential besides the integration into steering wheels. For example, flexible window-control sensors could be located in the center console, in seats, or in roof and door linings.

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ENORMOUS REDUCTION OF CO_2 EMISSIONS IN COAL-FIRED PLANTS

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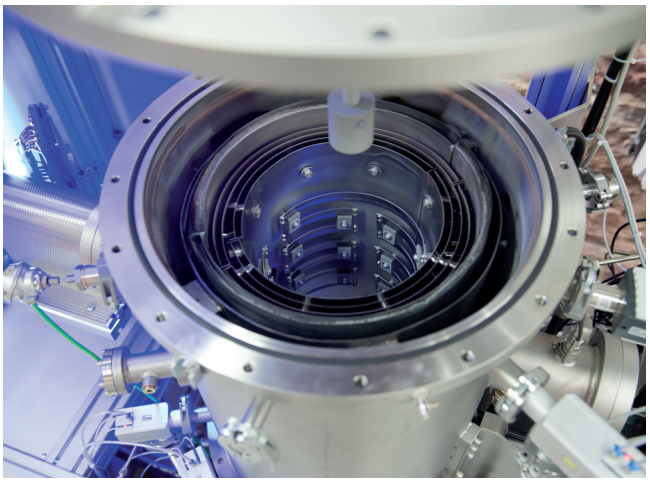
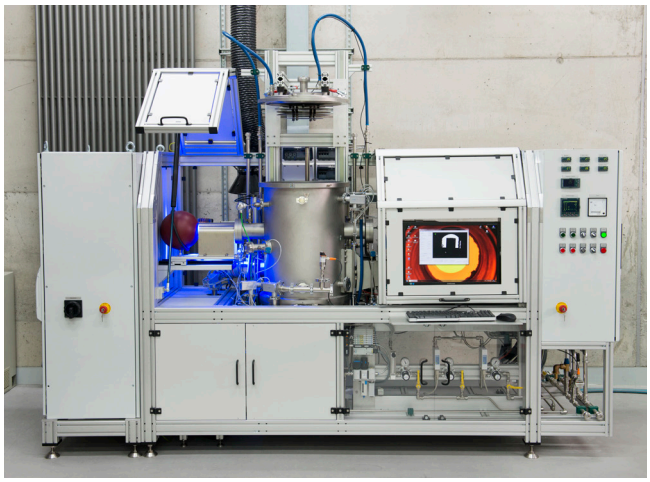
Coal-fired plants are essential baseload power sources as an alternative to nuclear power stations as long as the energy supply cannot be secured solely by solar, wind or hydropower. Their high CO_2 emissions, however, call for action both in terms of eco-friendliness and energy efficiency.

Owing to its thermo-optical measuring (TOM) devices, the Center of Device Development CeDeD was able to optimize combustion processes and so to significantly reduce CO_2 emissions and save energy. The key was a thorough TOM analysis and characterization of the coal combustion process and of the resulting combustion slags and gases. Main part of the TOM system is a high-temperature furnace provided with two windows: The left view window is used as an illumination opening, the right view one serves as an observation window. On the side of the observation window, a CMOS camera with special optics and filters is positioned to observe the coal combustion process. The system can be driven under controlled atmosphere from room temperature up to extremely high temperatures of 2400 °C. Contour changes of the test material during the heat treatment can be observed by picture analysis with a resolution of up to 0.3 µm. In addition, an IR spectrometer and a gas chromatograph can be connected to the inner furnace area to determine the nature of combustion gases. Also, if required, the process can be provided with controlled amounts of gas.

Based on the observations and collected data, the team of CeDeD researchers was able to optimize heating processes and reduce the emission of undesirable waste products. In the case of lignite coal-fired power plants, the cleaning process was optimized by lowering the temperature by 50 °C and by infeed of additive gases. This improvement led to a CO_2 emission reduction of around 10 percent. Given an annual amount of over 30 million tons of coal needed by a modern lignate coal fired plant to produce around 30 TWh electrical energy, this results in a CO_2 reduction of 3 million tons per year.





EELICON – SMART SHADING SYSTEM

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Under the coordination of Fraunhofer ISC thirteen international partners are collaborating in the EU-funded project EELICON to realize an innovative switchable light transmittance technology. The core development are mechanically flexible and light-weight electrochromic (EC) devices based on a polymer nanocomposite with a unique property profile that comprises mechanical flexibility, high safety, low weight, low switching voltage and high electrochromic contrast. The underlying coating technology is registered under the trade mark ISCoating®.

Major benefits of the EELICON EC film are its low dark and high bright state transmittance (5-10 percent and 60-65 percent, respectively), its fast response time (15-30 seconds for an A3 sized device), its high durability with more than 100,000 cycles verified under lab conditions, and its good thermal stability from -25 °C to beyond +60 °C. Currently, the partners work on the upscaling from lab to pilot scale.

The EELICON EC film can be applied via cost-effective roll-to-roll processing. Among the many possible applications is the retrofitting of vehicle windows for more safety and comfort and less air conditioning requirements. The manufacturer of aircraft and motorsport car components TEKS and the automotive electronics supplier Masermic are now testing the devices according to automotive standards, e. g. for use in racing cars and electric vehicles. The validation of the EELICON technology in the automotive sector will offer the opportunity to approach different markets, starting from the tuning and motorsport sectors, then moving to the high-end cars customization and finally reaching, in the medium to long term, automotive mass production with a consolidated product.

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The project receives EU funding under the Seventh Framework Program – grant agreement N° 604204.

WHAT CAUSES BATTERY AGING?

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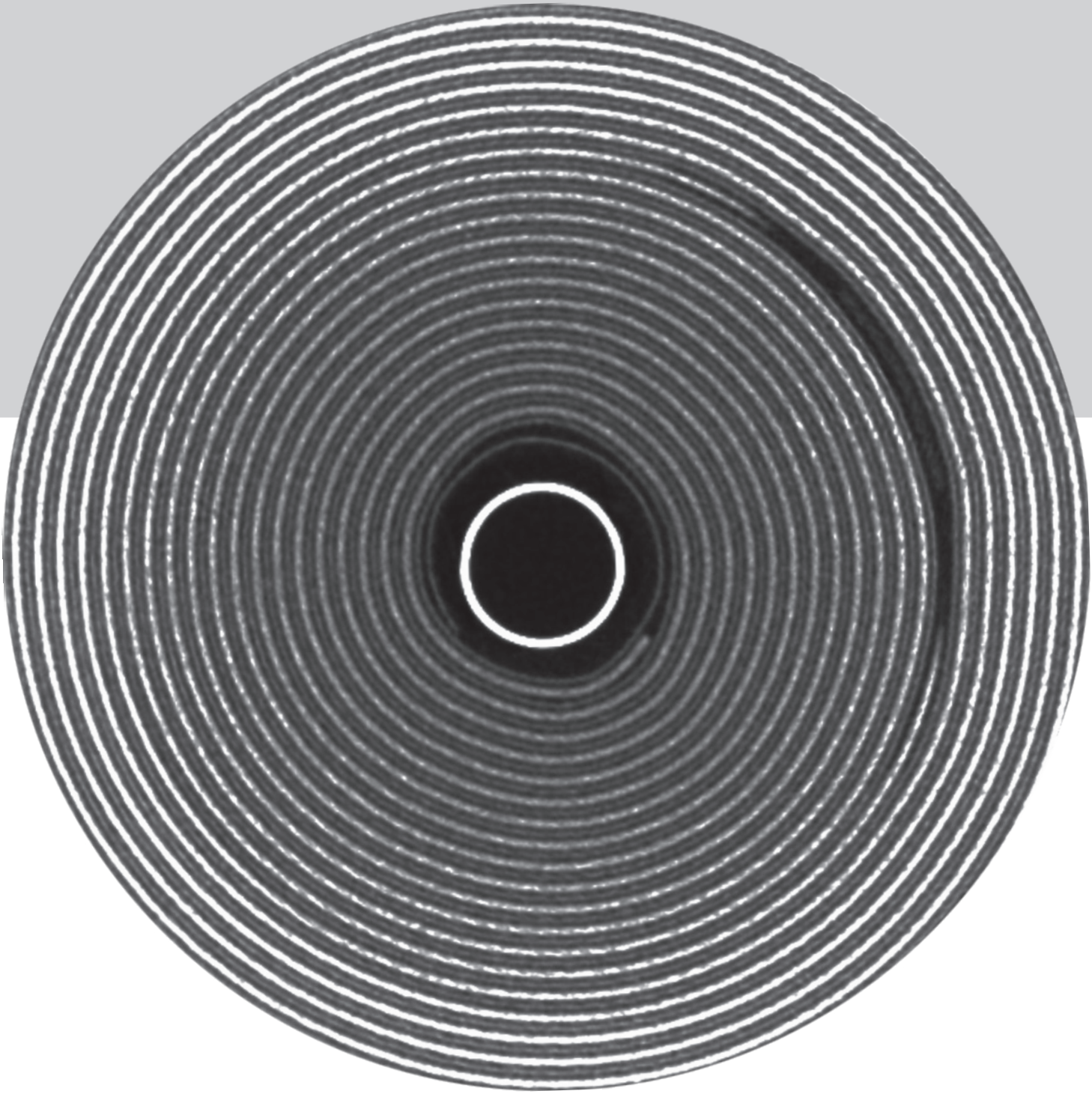
The booming e-bike market and a growing demand for electric vehicles promote the need for safe and reliable battery solutions. In response, manufacturers focus on the development of long-range durable batteries. A residual capacity of 80 percent usually defines the end of a battery's life: At this point, the power curve is experiencing a significant bend and rapid nonlinear aging begins.

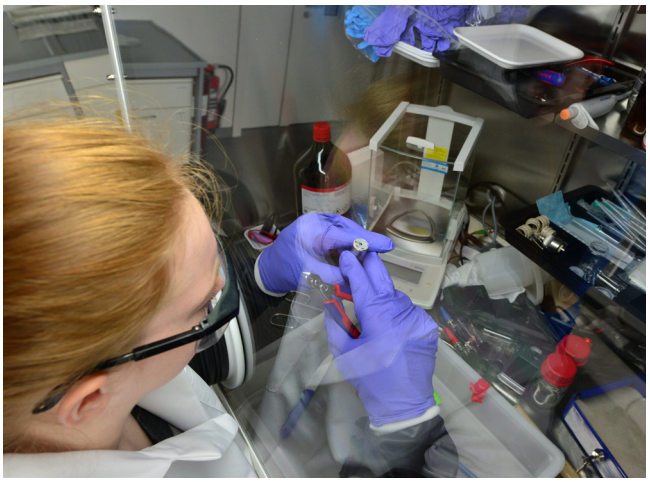
The EU funded AbattReLife project set out to investigate causes of aging and capacity loss. At Fraunhofer ISC, it was the part of the Center for Applied Electrochemistry to examine waste batteries from first generation electric vehicles and to compare them with laboratory cells of identical design especially made for this purpose and submitted to controlled rapid aging. The researchers performed an array of mechanical, thermal, and chemical tests on both the waste batteries and laboratory cells to collect data for a thorough analysis of cell alterations. They came up with the fact that small areas of the anode show microfractures and a metallic lithium plating just before the performance begins to decrease. The most pronounced causes were found to be excessive charge rates and an ill-designed conductor which compressed certain areas stronger than the rest of the battery and so induced a local overload.

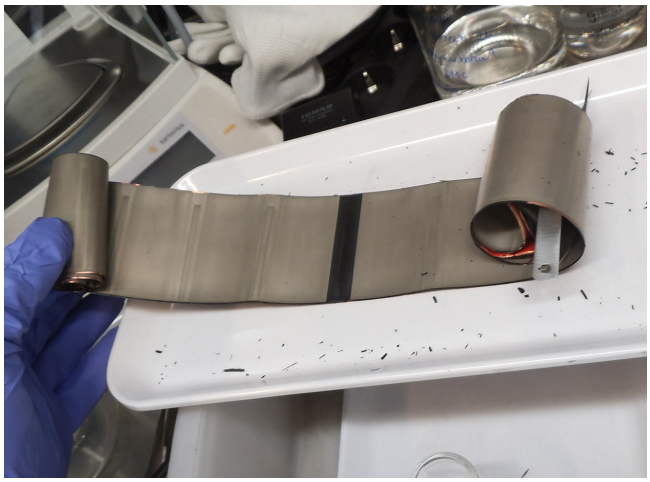
A revised cell design could therefore offer a way to prevent lithium plating. It should avoid mechanical stress and excessive local compression by the conductor. Also, the charging process should be precisely controlled in terms of temperature, speed, and voltage. Such well-made batteries would then even be suitable to find a second life e. g. in stationary energy storage.

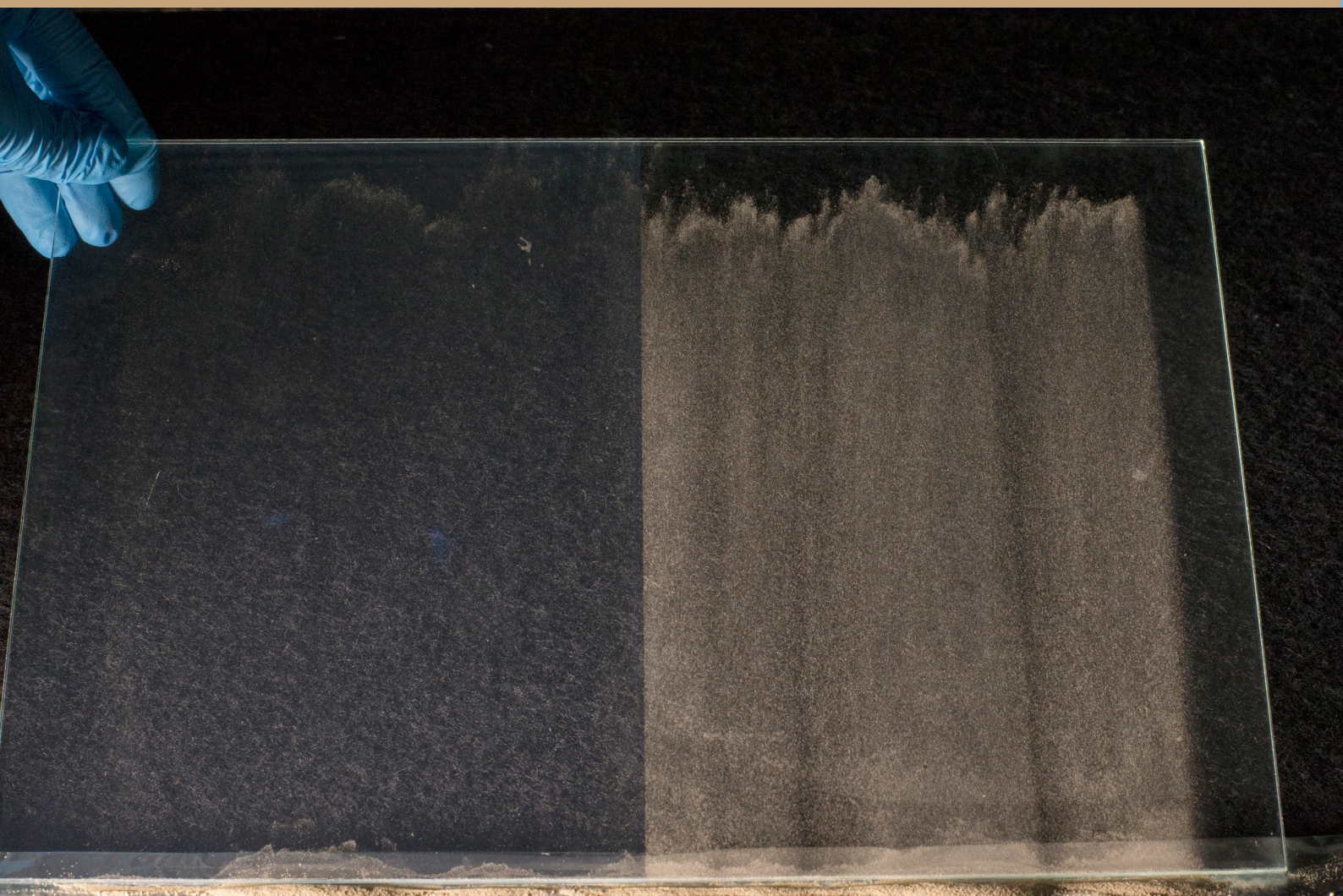
ABattReLife

This project receives funding under the EU program "Electromobility+"









NON-STICK COATINGS

REDUCE PRODUCTION RESIDUES

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Production residues occur even under the cleanest manufacturing conditions – particles or powders tend to stick to the interior surfaces of production plants. This may entail considerable downtime and expensive cleaning processes as quality standards have to be kept for different batches of products made on the same production line. Also, the materials left behind on surfaces along the way can add up to quite a substantial loss.

Fraunhofer ISC offers a solution: Customized coatings with adjustable non-stick properties. The team of researchers around Walther Glaubitt, head of Sol Gel Materials and Products at Fraunhofer ISC, is successfully testing them on printing inks from different manufacturers.

The coating is synthesized using the wet chemical route. It comprises non-metallic inorganic materials structured in a way to enhance the non-stick effect, preventing particles and powders from adhering to contact surfaces – similar to the well-known lotus effect. The coating is temperature resistant, food-safe, and free from fluorine-containing carbon compounds. Its functionality is as durable as the coating itself. It can be applied by dipping or spraying onto individual plant elements made of glass, ceramics, or metal and is subsequently activated by thermal curing. Special coating compositions are even suitable for certain types of plastic.

Since the thickness of the coating is way under 1 µm, the surfaces of pipes, valves, or other plant parts remain as good as unchanged so that coating is possible for all components prone to attracting and collecting residues.

In food industry, this could significantly reduce or even eliminate traces of allergens in batch products made on one and the same production line. In pharmaceutical production lines, it could help save expensive active agents which will no longer end up as residues but where they really belong – in a drug or packaging.

The benefits are also obvious for toner or color powder manufacturers who have to maintain highest batch-to-batch consistency for different colors run on the same line. Filling lines or storage containers would also profit from this kind of coating.

NOVEL COATING MATERIAL

FOR ENVIRONMENTALLY FRIENDLY GALVANIZING

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Galvanizing is a common method to finish the surfaces of plastic components, especially in the automotive sector. To ascertain attractive optics, pleasant haptics, and durable adhesion of metal coatings on plastic, today's state-of-the-art process involves a number of complex coating and separation steps.

The first step in finishing polymer or other surfaces of non-conductive materials through a galvanization process is the application of a thin, electrically conductive coating by way of "chemical metallization". Copper or nickel coatings are usually selected for this purpose. The deposition of a copper or nickel layer in a chemical metallization process requires a catalyst. To prepare materials for chemical metallization, they are usually provided with a palladium coating in a dip coating procedure. But this, in turn, cannot take place before pre-treatment in a number of acid baths. The search has been on for alternative conductive coatings to simplify this process and to eliminate environmentally harmful process steps. But so far, none of the alternatives did really work out well in actual practice, mostly because the high mechanical requirements in automotive applications cannot be met by purely organic intermediate layers.

The Fraunhofer ISC, with research partner ITW Automotive Products GmbH, now came up with a solid solution to simplify the metal plating of polyamide. The goal of the joint research project is to substitute the chemical metallisation of polyamide and to eliminate palladium from the entire process. ORMOCER®s turned out to be the key – established coating materials that are known for their excellent adhesion to metals and a variety of plastics. The researchers developed a novel conductive coating material that is suitable for wet-chemical application and directly provides a galvanizable surface on polyamide. Main challenges were good adhesion and sufficient conductivity to allow for a high deposition rate during metal plating. Both challenges were overcome thanks to the extraordinary versatility of ORMOCER® chemistry. The new material is a milestone on the way to environmentally friendly and resource efficient galvanization solutions. Further project work includes target optimizations, e.g. of the surface quality of the intermediate layer, to guarantee smooth metal surfaces in the end.

ITW Automotive OEM
Fuel, Release & Trim

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HOW PLANETS ARE FORMED

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There are many questions left unanswered regarding the formation of planets. According to current knowledge, many planetary bodies are formed from small silicate beads – so-called chondrules – that are about 0.1 to 3 mm wide. These original particles had the consistency of hot, liquid glass before they aggregated into larger conglomerates of rock, cooled down and crystallized. The Westphalian Wilhelms University of Münster and the Technical University of Braunschweig set out to explore how this led to the formation of asteroids and ultimately planets. Since the kind of glass they required for their experiments is very different from the material composition of common technical glasses they turned to the experts at Fraunhofer ISC for the development of a glass with just the properties and behavior theoretically assumed to be at the origin of planet formation.

To represent the chondrules as realistically as possible in the planned experiment, the team around Dr. Martin Kilo had to develop a specialty glass that mimics the composition of chondrules. Another challenge was to give the glass particles a spherical shape. To do so, the experts used two different procedures. In the first approach, rough glass gravel was prepared, sifted to the right size and then rounded out by thermal treatment. The second solution was to cut glass plates into small cubes and grind them mechanically. To provide for the required physical properties, the scientists used modeling programs to calculate in advance which melting conditions would prevail for the required compositions and at which temperatures they would crystallize into which forms. Various glass compositions were test-melted under controlled conditions until, finally, the beads which closest matched the theoretical model were selected for the project.

The research team from the Universities of Münster and Braunschweig used these beads in experiments at the Center for Applied Space Technology and Microgravity (ZARM) in Bremen: The drop tower which is operated there surrounds a 120-meter-high steel drop tube, in which a high-vacuum is kept. Through a catapult system, the glass beads were shot in a capsule to the tip of the drop tube. The resulting approximately 9.5 seconds of weightlessness offer the same conditions as in space. During this period, the glass beads are heated up to 1100 °C. During the dropping procedure, the beads can collide and form larger clusters. The project partners then analyzed the clusters to see how the beads merge, whether the clusters are composed of a homogeneous composition or the form of the individual beads is still recognizable, and whether and to what extent crystallization occurred. The results will then be compared to existing models on the formation of planets.

PRESERVATION OF CULTURAL HERITAGE

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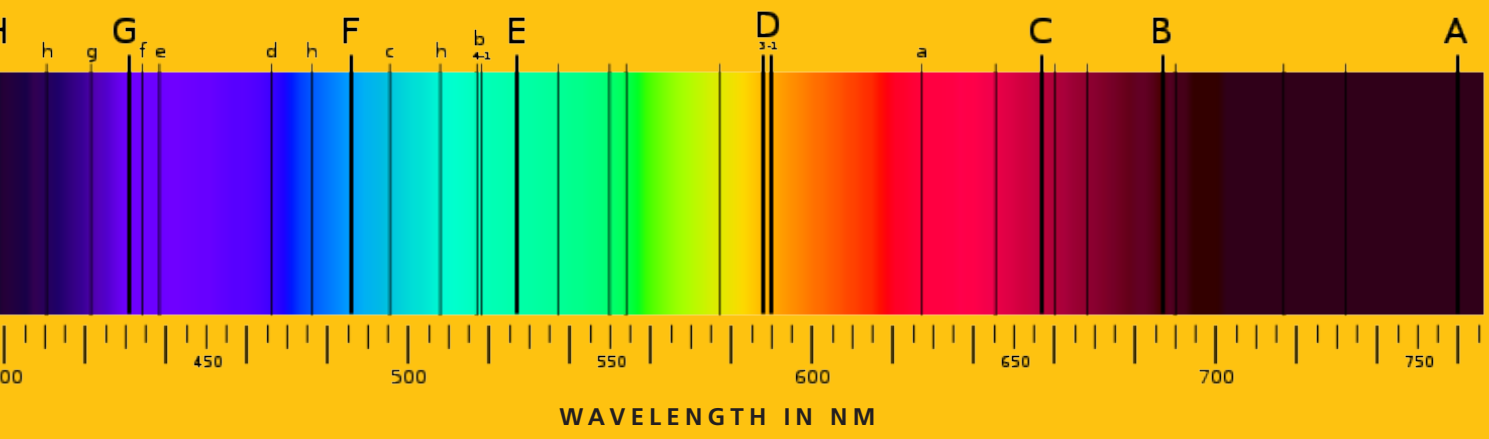
Outdoor weather exposure is not the only risk for cultural heritage. Indoor air pollution may be equally harmful to artwork in storage or on display in museums or historic buildings.

To be able to develop better strategies for the safekeeping of their artwork collections, the institution "Palaces and Gardens Throughout Baden-Württemberg in South-West Germany" (Staatliche Schlösser und Gärten Baden-Württemberg) entrusted the Fraunhofer ISC with a special monitoring project at two different sites: the Rastatt Favorite Palace and a storage depot in the city of Karlsruhe. Two series of measurements were to be carried out, one in summer, one in winter. Each monitoring period lasted three months. The measurements were completed by the end of 2015. They were performed by means of glass sensors developed by Fraunhofer ISC as early warning systems which register slightest structural changes caused by unfavorable ambient conditions. To quantify and qualify these changes, the dosimeters are subsequently examined by infrared spectroscopy in the laboratory. Further conclusions on harmful pollutants or influences may be derived from analyzing the crystalline deposits on the glass sensors.

Seasonal differences were especially noticeable in the measurements for the showrooms of the Favorite Palace. There is no air conditioning or heating in these rooms so that the indoor climate invariably reflects outdoor weather conditions. The rooms are also wide open to other influences such as effected by the many visitors during the summer months. Accordingly, the corrosive impact on the objects was generally more pronounced in the summertime.

The storage rooms of the Karlsruhe depot, on the other hand, are equipped with heating and humidity control. Despite seasonal differences, the overall measurements therefore revealed less problematic ambient conditions both in the rooms and inside depot cabinets.

The findings inspired the Palaces and Gardens Throughout Baden-Württemberg to look for cost-efficient and quickly implementable protection and care solutions as part of a reliable long-term preventive conservation strategy. Among the suggestions made by Fraunhofer ISC were simple measures like regular airing of the showcases and the use of absorber materials to reduce air pollutants.



FRAUNHOFER-GESELLSCHAFT

Research of practical utility lies at the heart of all activities pursued by the Fraunhofer-Gesellschaft. Founded in 1949, the research organization undertakes applied research that drives economic development and serves the wider benefit of society. Its services are solicited by customers and contractual partners in industry, the service sector and public administration.

At present, the Fraunhofer-Gesellschaft maintains 67 institutes and research units. The majority of the nearly 24,000 staff are qualified scientists and engineers, who work with an annual research budget of more than 2.1 billion euros. Of this sum, more than 1.8 billion euros is generated through contract research. More than 70 percent of the Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly financed research projects. Almost 30 percent is contributed by the German federal and governments in the form of base funding, enabling the institutes to work ahead on solutions to problems that will not become acutely relevant to industry and society until five or ten years from now.

International collaborations with excellent research partners and innovative companies around the world ensure direct access to regions of the greatest importance to present and future scientific progress and economic development.

With its clearly defined mission of application-oriented research and its focus on key technologies of relevance to the future, the Fraunhofer-Gesellschaft plays a prominent role in the German and European innovation process. Applied research has a knock-on effect that extends beyond the direct benefits perceived by the customer: Through their research and development work, the Fraunhofer Institutes help to reinforce the competitive strength of the economy in their local region, and throughout Germany and Europe. They do so by promoting innovation, strengthening the technological base, improving the acceptance of new technologies, and helping to train the urgently needed future generation of scientists and engineers.

As an employer, the Fraunhofer-Gesellschaft offers its staff the opportunity to develop the professional and personal skills that will allow them to take up positions of responsibility within their institute, at universities, in industry and in society. Students who choose to work on projects at the Fraunhofer Institutes have excellent prospects of starting and developing a career in industry by virtue of the practical training and experience they have acquired.

The Fraunhofer-Gesellschaft is a recognized non-profit organization that takes its name from Joseph von Fraunhofer (1787–1826), the illustrious Munich researcher, inventor and entrepreneur.

FRAUNHOFER GROUP MATERIALS

The Fraunhofer Group MATERIALS integrates the expertise of 15 Fraunhofer Institutes working in the field of materials science.

Fraunhofer materials research covers the entire value chain, from new material development and improvement of existing materials through manufacturing technology on a quasi-industrial scale, to the characterization of properties and assessment of service behavior. The same research scope applies to the components made from these materials and the way they function in systems. In all these fields, experimental studies in laboratories and technical institutes are supplemented by equally important numerical simulation and modelling techniques – across all scales, from individual molecules up to components and process simulation. As far as 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.

The Group's expertise is concentrated specifically in the fields of energy and environment, mobility, health, machine and plant construction, building construction and living, microsystems technology and safety. Innovative systems are developed using materials and components customized for specific applications, and based on the assessment of the behavior of a material or component under specific conditions of use. Strategic forecasts promote the development of novel, future-oriented materials and technologies.

Objectives of the Group are:

- Enhancing safety and comfort and reducing resource consumption in the fields of transport, machine and plant construction, building construction and living
- Increasing the efficiency of systems for energy generation, energy conversion, energy storage and distribution
- Improving the biocompatibility and functioning of medical materials and materials used in biotechnology
- Increasing integration density and improving the usability characteristics of microelectronic components and microsystems
- Enhancing the utilization of natural resources and improving the quality of products made with them
- Development of recycling concepts

Members of the Fraunhofer Materials Group are the Fraunhofer Institutes for

- Applied Polymer Research IAP
- Building Physics IBP
- Structural Durability and System Reliability LBF
- Chemical Technology ICT
- Manufacturing Technology and Advanced Materials IFAM
- Wood Research, Wilhelm-Klauditz-Institut, WKI
- Ceramic Technologies and Systems IKTS
- High-Speed Dynamics, Ernst-Mach-Institut, EMI
- Microstructure of Materials and Systems IMWS
- Silicate Research ISC
- Solar Energy Systems ISE
- Systems and Innovations Research ISI
- Mechanics of Materials IWM
- Non-Destructive Testing IZFP
- Wind Energy and Energy System Technology IWES

Associated Institutes:

- Industrial Mathematics ITWM
- Interfacial Engineering and Biotechnology IGB
- Integrated Circuits IIS.

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Information on presented projects

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Teilvorhaben: Untersuchung der Alterungsmechanismen von Elektromobilbatterien zur Vorhersage der Degradierung
Förderung durch das Bundesministerium für Wirtschaft und Technologie im Rahmen des Förderprogramms »ERA-NET Plus Electromobility+«
Förderkennzeichen: 01MX12002
Projektpartner: BMW AG, TNO, DNV GL, PSA Peugeot Citroen, Pôle V'hicule du Futur, TU München, TU Bergakademie Freiberg, Université de Technologie de Belfort-Montbéliard, Université de Technologie de Troyes, Fraunhofer ISC
Laufzeit: 1.5.2012 – 30.6.2015
www.abattrelife.eu

CO-Pilot – Flexible pilot scale manufacturing of cost-effective nanocomposites through tailored precision nanoparticles in dispersion
EU-Förderprojekt im Programm »H2020-NMP-PILOTS-2014«
Projektpartner: Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (TNO), Süddeutsches Kunststoff-Zentrum SKZ, Momentive Performance Materials GmbH, LS Instruments AG, Sonaxis SA, Institute of Occupational Medicine, Trinity College Dublin, Carl Padberg Zentrifugenbau GmbH, Nabaltec AG Ioniqa Technologies BV, Kriya Materials BV, Stichting Nanohouse, Fraunhofer ISC
Laufzeit: 1.1.2015 – 31.12.2017
www.h2020copilot.eu

EELICON – Enhanced energy efficiency and comfort by smart light transmittance control
EU-Förderprojekt im Programm »NMP.2013.4.0-3«
Projektpartner: Fraunhofer ISC, Fraunhofer COMEDD, Coatema Coating Machinery GmbH, YD Ynvisible, S.A., TEKS SARL, MASER Microelectrónica S.L., LCS Life Cycle Simulation GmbH, INSTM - National Interuniversity Consortium on Material Science and Technology, Institut de Recherche d'HydroQuebec
Laufzeit: 1.1.2014 – 30.6.2017
www.eelicon.eu

Herstellung von Glaskugeln für Fallversuche
Projektpartner: Technische Universität Braunschweig, Westfälische Universität Münster, Institut für Planetologie, Fraunhofer ISC
Laufzeit: 15.12.2014 – 30.9.2015

MinSEM – Forschungsprojekt zur Schließung von Wertstoffkreisläufen im Bereich mineralische Aufbereitungs- und Produktionsrückstände
Förderung durch das Bundesministerium für Bildung und Forschung im Rahmen des Förderschwerpunktes »r4 – Innovative Technologien für Ressourceneffizienz – Forschung zur Bereitstellung wirtschaftsstrategischer Rohstoffe« im Rahmenprogramm »Forschung für nachhaltige Entwicklung (FONA)«
Laufzeit: 1.6.2015 – 31.5.2018

INFORMATION ON PRESENTED PROJECTS

Moni-Shirt – Medizinische Bewegungsanalyse mit Hilfe körperkonformer, großflächiger Sensorik
Förderung durch das Bundesministerium für Bildung und Forschung
Projektpartner: Fraunhofer ISC, Fraunhofer ISIT
Laufzeit: 1.6.2015 – 31.5.2016

ZeSMa – Aufbau und Betrieb eines Zentrums »Smart Materials« – Entwicklung und Applikationen
Förderprogramm »Bayern FIT« durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie
Laufzeit: 13.5.2009 - 30.6.2016
www.cesma.de

ZfAE – Zentrum für Angewandte Elektrochemie
Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie im Rahmen des Förderprogramm »Aufbruch Bayern«
Förderkennzeichen: VIII/3f-3629/66/5
Laufzeit: 1.4.2011 – 31.12.2018

FZEB – Fraunhofer-Forschungs- und Entwicklungszentrum Elektromobilität Bayern
Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie
Laufzeit: 1.8.2015 – 31.12.2019

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Current Projects with public funding

3DNanoZell – Zellbasierte Assays auf 3D-bottom-up-nanostrukturierten Oberflächen für regenerative Implantate und Trägerstrukturen
Ein Fraunhofer-Attract-Projekt
Laufzeit: 1.1.2013 – 31.12.2018

ANIMON – Anisotrope hierarchisch strukturierte poröse Glasmaterialien, Unterauftrag: Untersuchungen zur Herstellung von Glasstäben und -rohren aus entmischbaren Gläsern
Im Rahmen eines AIF-ZIM-Kooperationsprojekts gefördert
Projektpartner: Universität Leipzig, boraident, Jodeit, Surflay, arteos, Fraunhofer IAP, Technische Universität Illmenau, Fraunhofer ISC
Laufzeit: 1.4.2012 – 31.3.2015

ATFEST – Entwicklung eines adaptiven Türfeststellers mit magnetorheologischen Elastomeren
Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie im Rahmen des Förderprogramms »Mikrosystemtechnik Bayern«
Förderkennzeichen: BAY192/003
Projektpartner: Geiling Maschinenteile GmbH, InnoSent GmbH, Fraunhofer ISC
Dauer: 1.12.2014 – 30.11.2016

BayForZirkon – Herstellung von Lochraster-Platten aus vollstabilisiertem Zirkonoxid über ein Schlickergießverfahren
Bayerische Forschungsstiftung im Rahmen des Programms Hochtechnologien des 21. Jahrhunderts
Projektpartner: Issendorfer Thermoprozesstechnik e.K., Fraunhofer ISC
Laufzeit: 1.1.2015 – 31.12.2015

BISYKA – Biomimetischer Synthesekautschuk in innovativen Elastomerkompositen
Ein Förderprojekt der Fraunhofer-Gesellschaft – Marktorientierte Vorlaufforschung – MAVO
Projektpartner: Fraunhofer IAP, Fraunhofer IME, Fraunhofer IWM, Fraunhofer ISC
Laufzeit: 1.3.2015 – 28.2.2018

CelPact – Verankerung von Regenartfasern auf der Basis von Holzcellulose
Förderung durch das Bundesministerium für Ernährung und Landwirtschaft, Fachagentur für Nachwachsende Rohstoffe e.V.
Laufzeit: 1.9.2015 – 31.8.2016

DEGREEN – Dielektrische Elastomer-Generatoren für regenerative Energien
Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie
Projektpartner: Westsächsische Hochschule Zwickau, Zentrum für Telematic, Fraunhofer ISC
Laufzeit: 1.6.2012 – 31.5.2019

DIBBIOPACK – Development of injection and blow extrusion molded biodegradable and multifunctional packages by nanotechnology: improvement of structural and barrier properties, smart features and sustainability
EU-Förderprojekt im Programm »EU-7RP-ICT-STREP«
Förderkennzeichen 280676
Projektpartner: Aitiip Foundation, INSTM, ARCHA, Gorenje Orodjarna, Tecos, Plasma LTD, Avanzare innovación tecnológica, Incerplast, B-Pack, COSMETIC, ATT, PURAC, Condensia Química, Georgia Tech Ireland, Sogama, Danone, Alapis, ALMA, Fraunhofer ISC
Laufzeit: 1.3.2012 – 29.2.2016
www.dibbiopack.eu

CURRENT PROJECTS WITH PUBLIC FUNDING

Dracula – »Mit Biss ins hohe Alter« – Automatisierbares Verfahren für hochästhetische, belastungsstabile Prothesenzähne
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Projektpartner: Fraunhofer IBMT, Fraunhofer ISC
Laufzeit: 1.6.2013 – 30.11.2015

e-STROM – Verbundvorhaben: Situativ thermisch optimierte Materialien – Teilvorhaben: Konzepterstellung für schaltbaren Wärmeübergang
Förderung durch das Bundesministerium für Bildung und Forschung im Rahmen des Förderprogramms »Schlüsseltechnologien für die Elektromobilität – STROM 2«
Förderkennzeichen: 523-76620-84/2
Projektpartner: Volkswagen Konzernforschung, TLK-Thermo GmbH, Fludicon GmbH, Spiga GmbH, Fraunhofer IWU, Fraunhofer ISC
Laufzeit: 1.1.2013 – 31.12.2015

ECWin2.0 – Smart Windows der 2. Generation – Teilvorhaben: Elektrochrome Beschichtung für neuartige Smart Windows
Förderung durch das Bundesministerium für Bildung und Forschung
Projektpartner: EControl-Glas GmbH, Julius-Maximilians-Universität Würzburg, GfE-Fremat, Fraunhofer IST, Fraunhofer ISC
Laufzeit: 1.1.2015 – 31.12.2017

ELCER_Tools – Elektroerosiv bearbeitbare Keramiken für Werkzeug- und Maschinenbau
Gefördert im Rahmen des Programms »Neue Werkstoffe in Bayern«
Laufzeit: 1.12.2015 – 30.11.2018

EIT KIC Raw Materials
EU-Förderprogramm: Bayern EIT
129 Partner aus 22 Ländern (alle großen Forschungsinstitutionen der EU und wesentliche Industriepartner sind vertreten)
Laufzeit: 9.12.2014 – 31.12.2022
www.eitrawmaterials.eu

EnerTHERM – Energieeffiziente Thermoprozesse
Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie
Laufzeit: 1.2.2013 – 31.1.2018

ENVer – Entwicklung einer Norm für die Härteprüfung keramischer Verbundwerkstoffe
Gefördert durch das Bundesministerium für Wirtschaft und Energie
Laufzeit: 1.11.2015 – 31.10.2017

EREAN – European rare earth (magnet) recycling network Marie Curie Initial Trainee Network
EU-Förderprojekt im Programm »EU-7RP-NMP.2013.4.0-3«
Partner: Katholieke Universiteit Leuven (B), Chalmers University of Technology, Göteborg, Solay, Umicore, Technische Universiteit Delft, The University of Birmingham, Öko-Institut e.V., University of Helsinki, Fraunhofer ISC
Laufzeit: 1.9.2013 – 31.8.2017
www.erean.eu

ESMobs – Ebene Schichtstrukturen für Mikrooptiken bildgebender Systeme
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Projektpartner: Fraunhofer HHI, Fraunhofer ISC
Laufzeit: 1.12.2015 – 31.12.2017

LAUFENDE PROJEKTE MIT ÖFFENTLICHER FÖRDERUNG

EU-FLASHED – Flexible Large Area Sensors for Highly Enhanced Displays
EU-Förderprojekt im Programm »EU-7RP-ICT-STREP«
Förderkennzeichen: 611104 FP7-ICT-2011-8
Projektpartner: FH OÖ Forschungs- und Entwicklungs GmbH – University of Applied Sciences Upper Austria, Microsoft, Joanneum Research Forschungsgesellschaft mbH, Plastic Logic Germany, Fraunhofer ISC
Laufzeit: 1.10.2013 – 1.10.2016
www.flashed-project.eu

Faserverstärkte Werkstoffsysteme – Technologieentwicklung zur CMC-Armierung von Kraftwerksrohren
Gefördert durch das Bundesministerium für Wirtschaft und Energie, COORETEC-Initiative des 6. Energieforschungsprogramms
Projektpartner: Schunk GmbH, Großkraftwerk Mannheim GKM AG, Bilfinger, Materialprüfungsanstalt Universität Stuttgart MPA, Ceramic Materials Engineering Universität Bayreuth, Fraunhofer ISC Laufzeit: 1.10.2015 – 30.9.2018

flex25 – Validierung einer Rolle zu Rolle Technologie zur Herstellung einer Verkapselungsfolie
Förderung durch das Bundesministerium für Bildung und Forschung
Förderkennzeichen: 03V0224
Projektpartner: Fraunhofer IVV, Fraunhofer FEP, Fraunhofer ISC
Laufzeit: 1.5.2013 – 30.4.2016

FOWINA – Formung des Winkelspektrums von Nanostruktur-Farbsensoren mit mikro-optischen Strahlführungselementen
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Laufzeit: 1.7.2015 – 30.6.2017

FußMed – Fußdrucksensorik für medizinische Anwendungen
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Projektpartner: Fraunhofer IIS, Fraunhofer ISC
Laufzeit: 1.7.2013 – 30.6.2015

gagendta+
Förderung durch das Bundesministerium für Bildung und Förderung
Laufzeit: 01.06.2015 – 31.05.2018

Grünes Gewölbe – Evaluierung und Modifizierung neuartiger Schutzkonzepte für durch anthropogene Umwelteinflüsse geschädigte Goldemailpretiosen, Elfenbein- und Bergkristallkunstobjekte – Modellhafte Anwendung am national bedeutenden Sammlungsbestand des Grünen Gewölbes, Dresden
Förderung durch die Deutsche Bundesstiftung Umwelt (DBU), sowie den Main-Tauber-Kreis
Förderkennzeichen: Az 33205
Laufzeit: 23.11.2015 – 22.11.2018

Habitat-Kammer – Hochaufgelöste in situ Rasterelektronen-Mikroskopie von biodegradierbaren Zellträgerstrukturen
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Laufzeit: 1.12.2014 – 31.5.2016

CURRENT PROJECTS WITH PUBLIC FUNDING

HarWin – Harvesting solar energy with multifunctional glass-polymer windows
EU-Förderprojekt im Programm »FP7-2012-NMP-ENV-ENERGY-ICT-EeB«
Projektpartner: UBT - University of Bayreuth, JRC - Joint Research Centre- European Commission, WUT - The West Pomeranian University of Technology, ISMTX - ISOMATEX S.A., IES - Integrated Environmental Solutions, InG - INGLAS Produktions GmbH, GX - GLASSX AG, EF - Eckart Pigments Ky, CSG - Centrosolar Glas GmbH, BayFOR - Bayerische Forschungsallianz GmbH, NMB - Neue Materialien Bayreuth, EP - Eckart GmbH, Fraunhofer ISC
Laufzeit: 1.9.2012 – 31.8.2015

In-Light – Innovative bifunctional aircraft window for lighting control to enhance passenger comfort
EU-Förderprojekt im Programm »EU-7RP European Aeronautics Science Network« (EASN)
Projektpartner: Fundación CIDETEC, Airbus Group, GKN Aerospace, EASN Technology Innovation Services BVBA, VTT Technical Research Centre of Finland, Fundación TEKNIKER, Institut de Recherche d'Hydro-Quebec, Andalusian Foundation for Aerospace Development – Center for Advanced Aerospace Technologies, Consorzio Venezia Ricerche
Laufzeit: 1.11.2012 – 31.10.2015

INCOM – Industrial production processes for nano-reinforced composite structures
EU-Förderprojekt im Programm »EU-7RP-NMP/2007-2013«
Förderkennzeichen: FoF NMP2013-10-608746
Projektpartner: VTT Technical Research Centre of Finland, Luleå University of Technology, Technical University of Denmark, 2B Srl, Diehl Aircabin GmbH, Axon Automotive, Millidyne Oy, VMA-Getzmann, SurA Chemicals GmbH, Bergius, CSI Composite Solutions and Innovations Oy, EconCore N.V., Fraunhofer ISC
Laufzeit: 1.9.2013 – 31.8.2017

KERMIT – Keramische Kompositmaterialen für Industrie-, Automotive- und Konsumeranwendungen
Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie im Rahmen des Förderprogramms »Neue Werkstoffe«
Förderkennzeichen: NW-1405-0009
Projektpartner: Schaeffler Technologies GmbH & Co. KG, Oechsler AG, TOP Oberflächen GmbH, Fraunhofer ISC
Laufzeit: 1.10.2014 – 30.9.2017

Klassifizierung von Schadensbildern an musealen Hohlgläsern, Teil I und II
Förderung durch Staatliche Schlösser und Gärten Baden-Württemberg
Laufzeit: seit 10/2015
Knochenzemente – »Mobil und aktiv auch im Alter« – Hochwertiger Ersatz für MMA/PMMA-basierte Knochenzemente
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Projektpartner: Fraunhofer IBMT, Fraunhofer ISC
Laufzeit: 1.1.2014 – 31.12.2015

KrAnich – Kratzfeste Antireflektionsschichten auf Polymeroberflächen
Förderung durch das Bundesministerium für Wirtschaft und Energie
Förderkennzeichen: 03ET1235A
Projektpartner: Humboldt-Universität Berlin, Solvay Fluor GmbH, Irlbacher Blickpunkt Glas GmbH, Prinz Optics GmbH, Fraunhofer ISC
Laufzeit: 1.9.2014 – 31.8.2017

LAUFENDE PROJEKTE MIT ÖFFENTLICHER FÖRDERUNG

»Kritikalität Seltener Erden«
Fraunhofer-Leitprojekt
Projektpartner: Fraunhofer IGB, Fraunhofer IWM, Frauhofer IWU, Fraunhofer IFAM, Fraunhofer LBF, Fraunhofer ISI, Fraunhofer ISC
Laufzeit: 15.11.2013 – 14.11.2017

LIMPID – Nanocomposite materials for photocatalytic degradation of pollutants
EU-Förderprojekt im Programm »EU-7RP-NMP«
Förderkennzeichen: NMP.2012.2.2-6
Projektpartner: C.N.R. IPCF & IRSA, POLYMAT, University of the Basque Country UPV/EHU, École polytechnique fédérale de Lausanne EPFL, Universiti Teknologi Malaysia AMTEC, Chulalongkorn University (CU) , McGill University, Johnson Matthey, Solvay Specialty Polymers, Xylem Water Solutions Herford GmbH, ACCIONA Infrastructure, Aquakimia Sdn Bhd, Fraunhofer ISC
Laufzeit: 1.12.2012 – 30.11.2015

Machbarkeitsstudie zur Restaurierung und Sicherung der Künstlerisch wertvollen Glasfassade van HAP Grieshaber am Hallenbad Stuttgart
Förderung durch die Landeshauptstatt Stuttgart, Hochbauamt
Laufzeit: seit 06/2015

Mantelfasern – Faserverstärkter Beton: Kern-Hülle-Glasfasern für beständigere Baustoffe
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Projektpartner: Fraunhofer IBP, Fraunhofer ISC
Laufzeit: 1.1.2015 – 31.12.2016

Mit Fraunhofer Innovationen unser Kulturerbe schützen – Ein Modellprojekt mit den Staatlichen Kunstsammlungen Dresden (SKD) und der Sächsischen Landesbibliothek – Staats- und Universitätsbibliothek Dresden (SLUB)
Förderung durch den Vorstand der Fraunhofer-Gesellschaft
Laufzeit: 1.06.2015 – 31.07.2018

MultiNaBel – Früherkennung und multimodaler Nachweis von Systemerkrankungen am Beispiel der Leukämie
Ein Förderprojekt der Fraunhofer-Gesellschaft – Marktorientierte Vorlaufforschung – MAVO
Projektpartner: Fraunhofer IME, Fraunhofer IIS, Fraunhofer ISC
Laufzeit: 1.1.2013 – 30.6.2016

µFLO – Selective Laser Etching, Laserpolieren und Zwei-Photonen-Polymerisation für Mikrofluidik und Optik
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Projektpartner: Fraunhofer ILT, Fraunhofer ISC
Laufzeit: 1.1.2015 – 31.12.2016

NANOMATCON – Multifunctional nanoparticles and materials controlled by structure
EU-Förderprojekt im Programm »EU-H2020-Teaming« / »H2020-EU.4.a.«
Projektpartner: Deutsch-Tschechische Industrie- und Handelskammer (DTIHK), Technische Universität Liberec, Fraunhofer ISC
Laufzeit: 1.6.2015 – 30.5.2016

PEDElEc – NES-PEDElEc-Pendler-E-Bike Dauertest mit elektronischen und elektrochemischen Untersuchungen
Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie
Förderkennzeichen: MOD-1209-0008
Laufzeit: 1.1.2013 – 29.2.2016

CURRENT PROJECTS WITH PUBLIC FUNDING

PlanDE – Planare dielektrische Elastomeraktoren in Multilayertechnologie für industrielle Anwendungen
Förderung durch das Bundesministerium für Bildung und Forschung
Förderkennzeichen: 13X4013E
Projektpartner: Bayer Material Science AG, Bayer Technology Services GmbH, Siemens AG, Eckart GmbH, Continental Automotive GmbH, TU Darmstadt – Institut für Elektromechanische Konstruktionen, Deutsches Kunststoff-Institut, Fraunhofer ISC
Laufzeit: 1.6.2012 – 30.11.2015

RECVAL-HPM
Förderung durch das Bundesministerium für Bildung und Förderung
Laufzeit: 1.7.2014 – 30.6.2017

RESLAG
EU-Förderprojekt im Programm H2020
Projektpartner: Arcelormittal Sestao SL, Deutsches Zentrum für Luft- und Raumfahrt EV, Casa Maristas Ezterlan, Eidgenössische Technische Hochschule Zürich, Imperial College of Science, Technology and Medicine, Friedrich-Alexander-Universität Erlangen-Nürnberg, Commissariat a l Energie Atomique et aux Energies Alternatives, HLG Management-Optimum Cement, Egenzia Nazionale per le nouve Tecnologie, L´energia e lo Sviluppo Economico Sostenibile, Teknologian tutkimuskeskus, Tapojärvi Oy, Alstom Power Systems SA, Life Cycle Engineering SRL, Moroccan Agency for Solar Energy SA, Zabala Innovation Consulting, S.A., Novagi Industries SL, Fraunhofer ISC
Laufzeit: 01.09.2015 – 28.02.2019

SAM SSA – Sugar alcohol based materials for seasonal storage applications
EU-Förderprojekt im Programm »ENERGY.2011.4.1-3: Materials for Advanced compact storage systems«
Förderkennzeichen: 296006
Projektpartner: CNRS - Centre National de la Recherche Scientifique, Rhodia Operations, IMNR - Institutul National de Cercetare - Dezvoltare Pentru metale Neferoase si Rare, TUE - Technische Universiteit Eindhoven, CICe - Centro de Investigacion Cooperativa de Energias Alternativas Fundacion, AIDICO - Asociacion de Investigacion de las Industrias de la Construccion, PPL - Phase Change Material Products LTD, Eurice - European Research and Project Office GmbH, , Fraunhofer ISC
Laufzeit: 1.4.2012 – 31.3.2015

SealS – Sealing stacks – Glasbasierte Fügesysteme für die Hochtemperaturbrennstoffzellen
Förderung durch das Bundesministerium für Wirtschaft und Energie
Projektpartner: ElringKlinger AG, Karlsruher Institut für Technologie (KIT), Fraunhofer ISC
Laufzeit: 1.3.2013 – 29.2.2016

SEEDs – Wachstumskeime für ein energieautarkes Bayern Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie im Programm »Aufbruch Bayern«
Förderkennzeichen: VIII/3 - 3624/35/7
Projektpartner: Fraunhofer-Institut IISB, Fraunhofer IIS, Fraunhofer ISC
Laufzeit: 1.1.2013 – 31.12.2015

SiC-Tec 3 – Entwicklung einer europäischen SiC-Faser und Technologieoptimierung, Phase III
Gefördert im Programm »Neue Werkstoffe in Bayern«
Projektpartner: BJS Ceramics GmbH, Fraunhofer ISC
Laufzeit: 1.7.2015 – 30.6.2018

LAUFENDE PROJEKTE MIT ÖFFENTLICHER FÖRDERUNG

Smartonics – Development of smart machines, tools and processes for the precision synthesis of nanomaterials with tailored properties for organic electronics
EU-Förderprojekt im Programm »EU-FP7-NMP-2012-LARGE-6«
Förderkennzeichen: 310229
Projektpartner: Coatema Engineering GmbH, University of Patras, University of Oxford, University of Surrey, Panepistimio Ioanninon, Centre National de la Recherche Scientifique, Universität Stuttgart, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Horiba Jobin Yvon S.A.S., ADVEN, Coatema Coating Machinery GmbH, Compucon Efarmoges Ypologiston Anonymi Viomichaniki Emporiki Etairia, Aixtron SE, Oxford Lasers LTD, Centro Ricerche Fiat SCPA, Plastic Logic GmbH, Organic Electronic Technologies P. C., Fraunhofer ISC; Laufzeit: 1.1.2013 – 31.12.2016

Smart Scaffolds – Aktuatorische Zellträgerstrukturen für die Züchtung von Herzmuskel-Gewebeersatz
Ein Förderprojekt der Fraunhofer-Gesellschaft – Mittelstandsorientierte Eigenforschung – MEF
Laufzeit: 1.7.2012 – 31.12.2015

Strom als Rohstoff – Teilprojekt 3
Fraunhofer- Leitprojekt
Projektpartner: Fraunhofer Umsicht (Koordinator), Fraunhofer IAP, Fraunhofer ICT, Fraunhofer IGB, Fraunhofer IKTS, Fraunhofer IST, Fraunhofer ITWM, Fraunhofer IVV, Fraunhofer WKI, Fraunhofer ISC
Laufzeit: 1.8.2015 – 31.07.2018

Sulfonsäure-Adhäsiv – Innovatives dentales Adhäsivsystem mit multifunktionalen Haftstrukturen – Teilprojekt: Multifunktionelle Materialbasis für einfach applizierbare, langzeitstabile dentale Adhäsive
Förderung durch das Bundesministerium für Wirtschaft und Energie im Rahmen des Förderprogramms »Zentrales Innovationsprogramm Mittelstand ZIM«
Förderkennzeichen: KF2242808CS3
Projektpartner: VOCO GmbH, Fraunhofer ISC
Laufzeit: 1.1.2014 – 30.6.2016

Sunflower – SUstainable Novel FLexible Organic Watts Efficiently Reliable
EU-Förderprojekt im Programm »EU-FP7-ICT-2011-7«
Förderkennzeichen: 287594
Projektpartner: Universiteit Antwerpen, AGFA-Gevaert N.V., Amcor Flexibles Kreuzlingen AG, Fachhochschule Nordwestschweiz, Fluxim AG, Belectric OPV GmbH, Universitat Jaume I de Castelló, Genes'Ink, Centre National de la Recherche Scientifique, Saes Getters S.P.A., Consiglio Nazionale delle Ricerche, Linkopings Universitet, Chalmers Tekniksa Hoegskola AB, Merck Chemicals LTD, Dupont Teijin Film UK LTD, Amcor Flexibles Singen GmbH, Université d'Aix Marseille, Fraunhofer ISC
Laufzeit: 1.10.2011 – 31.3.2016

TempoDis – Spatio-temporale Farb-Filter-Technologie für autostereoskopische 3D-Displays
Ein Förderprojekt der Fraunhofer-Gesellschaft – Marktorientierte Vorlaufforschung – MAVO
Laufzeit: 1.1.2013 – 31.12.2015

Treasores – Transparent electrodes for large area, large scale production of organic optoelectronic devices
EU-Förderprojekt im Programm »EU-FP7-ICT Photonics«
Förderkennzeichen: 314068
Projektpartner: Fraunhofer IVV, Fraunhofer ISE, Fraunhofer COMEDD, Swiss Federal Laboratories for Materials Science and Technology (Empa), Amanuensis GmbH, Sefar AG, Technische Universität Dresden, NPL Management Ltd., Universitat de Valencia, Osram GmbH, Canatu Oy, Aalto-Korkeakoulusaatio, Associan – Centro de Investigacion Cooperativa en Nanociencias – CIC NANOGUNE, Amcor Flexibles Kreuzlingen AG, Rowo Coating Gesellschaft für Beschichtung mbH, Eight19 Ltd, Quantis, Fraunhofer ISC
Laufzeit: 1.11.2012 – 31.10.2015

CURRENT PROJECTS WITH PUBLIC FUNDING

Wirkstoffverkapselung (VerbauWi) – Verkapselung bauchemischer Wirkstoffe
Förderung durch das Bundesministerium für Bildung und Forschung
Projektpartner: TU Berlin, Fraunhofer ISC
Laufzeit: 1.7.2013 – 30.6.2016

Würzburger Translationszentrum »Regenerative Therapien für Krebs- und Muskuloskelettale Erkrankungen« (TZKME)
Förderung durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie
Projektpartner: Fraunhofer IGB, Muskuloskelettales Centrum Würzburg (MCW), Lehrstuhl für Funktionswerkstoffe der Medizin und der Zahnheilkunde (FZM), Deutsches Zentrum für Herzinsuffizienz (DZHI), Comprehensive Cancer Center (CCC), Fraunhofer ISC
Laufzeit: 1.2.2013 – 31.1.2018

ZIBa – Zinkluft-Batterien als stationäre Energiespeicher
Förderung durch die Bayerische Forschungsstiftung im Rahmen des Förderprogramms »Hochtechnologien für das 21. Jahrhundert«
Förderkennzeichen: AZ-1025-12
Projektpartner: Eckart GmbH, Varta Microbattery GmbH, Universität Bayreuth, Fraunhofer ISC
Laufzeit: 1.3.2013 – 31.5.2015

ZIM-Spülsteine
Gefördert durch das Bundesministerium für Wirtschaft und Energie, Zentrales Innovationsprogramm Mittelstand (ZIM)
Projektpartner: PAHAGE GmbH & Co. KG, Viersen, Fraunhofer ISC
Laufzeit: 1.3.2015 – 31.8.2017

PATENTE

Patente
Patents

Bach, T.; Virsik, W.; Müller, J.; Bünsow, J.:
Temperierbare Messvorrichtung zur Charakterisierung von Batterien und Glovebox mit der temperierbaren Messvorrichtung
Gebrauchsmuster DE 20-2015-001284.1
Erteilungsdatum: 23.3.2015

Bittner, A.; Guntow, U.; Olsowski, B.-E.; Schulz, J.; Römer, M.:
Partikuläres Elektrodenmaterial mit einer Beschichtung aus einem kristallinen anorganischen Material und einem anorganisch-organischen Hybridpolymer und Verfahren zu dessen Herstellung
CN 104812485 A
Offenlegungsdatum: 29.7.2015

Bittner, A.; Guntow, U.; Olsowski, B.-E.; Schulz, J.; Uebe, J.:
Feststoff- / Gelelektrolyt-Akkumulator mit Binder aus anorganisch-organischem Hybridpolymer und Verfahren zu dessen Herstellung
CN 104871272 A
Offenlegungsdatum: 26.8.2015

Bittner, A.; Guntow, U.; Römer, M.; Milde, M.; Anfimovaite, V.:
Partikuläres Elektrodenmaterial mit einer Beschichtung aus einem kristallinen anorganischen Material und einem anorganisch-organischen Hybridpolymer und Verfahren zu dessen Herstellung
KR 2015-0088281 A
Offenlegungsdatum: 31.7.2015

Bittner, A.; Guntow, U.; Römer, M.; Milde, M.; Anfimovaite, V.:
Partikuläres Elektrodenmaterial mit einer Beschichtung aus einem kristallinen anorganischen Material und einem anorganisch-organischen Hybridpolymer und Verfahren zu dessen Herstellung
CN 104812485 A
Offenlegungsdatum: 29.7.2015

Bokelmann, K.; Selvam, Th.; Halbhuber, A.; Gunschera, J.F.; Thole, V.:
Holzwerkstoff und Verfahren zu dessen Herstellung
EP 2396154 B1
Erteilungsdatum: 7.1.2015

Böse, H.; Gerlach, Th.:
Blockiervorrichtung mit feldsteuerbarer Flüssigkeit sowie deren Verwendung
EP 2147219 A0
Offenlegungsdatum: 27.01.2010
2147219 B1
Erteilungsdatum: 12.8.2015

Böse, H.; Hassel, T.:
Volumenkompressible kapazitive flächige flexible Sensormatte zur Messung von Druck oder Druckverteilungen und/oder zur Messung oder Detektion von Deformationen
EP 2899521 A1
Offenlegungsdatum: 29.7.2015

Böse, H.; Hassel, T.:
Volumenkompressible kapazitive flächige flexible Sensormatte zur Messung von Druck oder Druckverteilungen und/oder zur Messung oder Detektion von Deformationen
DE 10-2014-201434 A1
Offenlegungsdatum: 30.7.2015

Brämer, T.; Gellermann, C.; Kilo, M.; Brämer, W.:
Verfahren zur Rückgewinnung und gegebenenfalls Trennung von Lanthaniden in Form ihrer Chloride oder Oxide aus mineralischen Abfällen und Reststoffen
DE 10-2014-101766 A1
Offenlegungsdatum: 13.8.2015

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Brämer, T.; Gellermann, C.; Kilo, M.; Brämer, W.:
Verfahren zur Rückgewinnung und gegebenenfalls Trennung von Lanthaniden in Form ihrer Chloride oder Oxide aus mineralischen Abfällen und Reststoffen
EP 2910654 A1
Offenlegungsdatum: 26.8.2015

Brinkmann, C.; Seyfried, M.; Boaretto, N.; Bünsow, J.; Hartmann, S.:
Elektrochemische Zelle mit einem organisch-anorganischen Hybridmaterial und Verwendungen eines anorganisch-organischen Hybridmaterials
DE 10-2014-206040 A1
Offenlegungsdatum: 1.10.2015

Cochet, A.; Schottner, G.; Posset U.; Pagani, G.; Abbotto, A.; Mari, C.; Beverina, L.; Ruffo, R.; Patriarca, G.:
Highly transparent electrochromic coating material with improved adhesion performance and method for producing the same
CA 2670983 C
Erteilungsdatum: 11.8.2015

Collin, D.; Domann, G.:
Silane, Hybridpolymere und Photolack mit Positiv-Resist-Verhalten sowie Verfahren zur Herstellung
US 2015/370169 A1
Offenlegungsdatum: 24.12.2015

Durschang, B. R.; Probst, J.; Thiel, N.; Bibus, J.; Vollmann, D.; Schusser U.:
Lithium disilicate glass-ceramics, method for production thereof and use thereof
JP 5698259
Erteilungsdatum: 8.4.2015

Durschang, B. R.; Probst, J.; Thiel, N.; Bibus, J.; Vollmann, D.; Schusser U.:
Lithium disilicate glass ceramics, method for the production thereof and use thereof
AU 2010335472
Erteilungsdatum: 16.7.2015

Durschang, B. R.; Probst, J.; Thiel, N.; Bibus, J.; Vollmann, D.; Schusser U.:
Lithium disilicate glass-ceramics, method for production thereof and use thereof
RU2552284
Erteilungsdatum: 29.4.2015

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Lithium disilicate glass-ceramics, method for production thereof and use thereof
US 2015-0246843 A1
Offenlegungsdatum: 3.9.2015

Durschang, B. R.; Probst, J.; Thiel, N.; Bibus, J.; Vollmann, D.; Schusser U.:
Lithium disilicate glass-ceramics, method for production thereof and use thereof
US 8956987 B2
Erteilungsdatum: 17.2.2015

Durschang, B. R.; Probst, J.; Thiel, N.; Gödiker, M.; Vollmann, D.; Schusser U.:
Lithium silicate glasses or glass ceramics, method for production thereof and use thereof
AU 201325524
Erteilungsdatum: 26.11.2015

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Lithium silicate glasses or glass ceramics, method for production thereof and use thereof
US 9125815 B2
Erteilungsdatum: 8.9.2015

Durschang, B. R.; Probst, J.; Thiel, N.; Gödiker, M.; Vollmann, D.; Schusser U.:
Lithium silicate glasses or glass ceramics, method for production thereof and use thereof
JP 5808416 B2
Erteilungsdatum: 10.11.2015

Durschang, B. R.; Probst, J.; Thiel, N.; Gödiker, M.; Vollmann, D.; Schusser U.:
Lithium silicate glasses or glass ceramics, method for production thereof and use thereof
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Antalyali, G., Wagener, R., Staab, T., Guntow, U., Sextl, G.:
Projektverbund UMWELTnanoTECH – Zwischenbilanz und Fachtagung, Straubing, 27. Februar 2015

Bach, T.:
Investigation of the aging of Li-ion cells' electrodes with incremental capacity curves.
Fachtagung »Kraftwerk Batterie«, Aachen, 28. – 29. April 2015

Böse, H.:
Influence of pre-strain on the actuation performance of silicone dielectric elastomer film actuators.
EuroEAP 2015, Tallinn, Estland, 9. – 10. Juni 2015

Böse, H.:
Dielectric elastomer compression sensors with variable design and material properties.
EuroEAP 2015, Tallinn, Estland, 9. – 10. Juni 2015

Brinkmann, C., Boaretto, N., Kapuschinski, M.:
Effect of Lithium ex-situ passivation in Lithium-polymer symmatric cells.
SIRBATT Workshop, Bilbao, Spain, 28. – 29. September 2015

Brinkmann, C., Boaretto, N., Seyfried, M., Bünsow, J., Müller, J., Kilo, M., Lorrmann, H., Sextl, G.:
Possible combinations of ceramic and polymer electrolytes for the use in lithium batteries.
Batterieforum Deutschland 2015, Berlin, 21. – 23. Januar 2015

Deinhardt, A.:
Study on the influence of hydroxide ions on the UV-transparency of soda-lime silicate glass by means of spectroscopic methods.
2. International Conference of Optical Characterization of Materials, Karlsruhe, 17. – 18. März 2015

SCIENTIFIC PRESENTATIONS

Flegler, A., Hartmann, S., Kapuschinksi, M., Sextl, G.:
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Batterieforum Deutschland 2015, Berlin, 21. – 23. Januar 2015

Koch, S.; Hackenberg, S.; Dembski, S.; Heuzé, K.:
Stabilization of TiO_2 nanoparticles in cell culture media.
BioNanoMed 2015, Graz, Österreich, 7. – 10. April 2015

Koch, S.; Weidner, R.; Dembski, S.; Heuzé, K.:
Photocatalytic luminescent TiO_2/SiO_2 nanoparticles.
Strategies in Tissue Engineering, Würzburg, 10. – 12. Juni 2015

Lorrmann, H.:
New Approach to Address Fundamental Challenges of Solid-State Batteries.
Batterieforum Deutschland 2015, Berlin, 21. – 23. Januar 2015

Lorrmann, H.:
New Approach to Address Fundamental Challenges of Solid-State Batteries.
AABC Europe 2015, Mainz, 26. – 29. Januar 2015

Mirza, M.:
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Probst, J.; Walles, H.; Bokelmann K.; Dembski, S.; Nickel, J.; Mladenow, R.; Thepen, T.; Meine, H.; Richter, M.:
Development and Evaluation of New Therapeutic Methods for Chronic Skin Diseases.
Forum Life Science 2015, München, 11. – 12. März 2015

Probst, J.; Walles, H.; Bokelmann K.; Dembski, S.; Nickel, J.; Mladenow, R.; Thepen, T.; Meine, H.; Richter, M.:
Development and Evaluation of New Therapeutic Methods for Chronic Skin Diseases.
BioNanoMed 2015, Graz, Österreich, 7. – 10. April 2015

Probst, J.; Walles, H.; Bokelmann, K.; Dembski, S.; Nickel, J.; Mladenow, R.; Thepen, T.; Meine, H.; Richter M.:
Development and Evaluation of New Therapeutic Methods for Chronic Skin Diseases.
Strategies in Tissue Engineering, Würzburg, 10. – 12. Juni 2015

Schott, M., Posset, U., Kurth, D. G., Jödicke, D.:
Smart Windows der 2. Generation (ECWin 2.0).
i-WING 2015 Konferenz, Dresden, 27. – 29. April 2015

Seifert, D. G.; Schmitt, Dr. V.:
A Comparative Evaluation Study of Methods for Thermal Shock Assessment.
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Settelein, J., Bockowski, P., Bozkaya, B., Lorrmann, H., Sextl, G.:
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Settelein, J., Hartmann, S., Trapp, V., Sextl, G.:
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AABC Europe 2015, Mainz, 26. – 29. Januar 2015

Settelein, J., Rumpel, M., Lorrmann, H., Sextl, G.:
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CESEP 2015 – 6th International Conference on Carbon for Energy Storage/Conversion and Environment Protection, Posen, Polen, 18. – 22. Oktober 2015

WISSENSCHAFTLICHE VERÖFFENTLICHUNGEN

Somorowsky, F., Kron, J., Kilo, M.:
Glass PCM Polymer Composites for Glazing Panes.
The World Sustainable Energy Days 2015, Wels, Österreich, 25. – 27. Februar 2015

Straßer, M.; Dembski, S.; Mandel, K.; Schrauth, J.; Haddad, D.; Ahrens, B.; Schweizer, S.; Walles, H.:
Multifunctional Nanoparticles for Medical Imaging.
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Straßer, M.; Dembski, S.; Mandel, K.; Schrauth, J.; Haddad, D.; Ahrens, B.; Schweizer, S.; Walles, H.:
Multifunctional Nanoparticles for Medical Imaging.
Forum Life Science 2015, München, 11. – 12. März 2015

Tagungsbände
Proceedings

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Textilforschung an der Hochschule Hof.
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Haas, K.-H.:
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Steenhusen, S., Burmeister, F., Eckstein, H.-C., Houbertz, R.,:
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Tagungsband Biomaterialien 2015, Forum MedTech Pharma (2015)

Wolter, H.:
Enabling chairside indirect restauration with adapted ORMOCER®-based resins/composites.
Composites at Lake Louise-2015, Lake Louise, Alberta, Canada, 8.-12. November 2015 (2015)

Bachelor-Arbeiten
Bachelor theses

Oehm, N.:
Studie zur Herstellung von Li1+xAlxTi2-x(PO4)3-Elektrolytschichten über Sol-Gel-Prozesse für den Einsatz in Festkörperbatterien.

Rigato, R.:
Synthesis of polymer electrolytes for lithium batteries and study of a possible application as binder in electrodes formulations.

Rupp, M.:
Synthese und Charakterisierung von Poly(2-oxazolin)en für den Einsatz in modernen Elektrolyt-Formulierungen.

Weishaupt, A.:
Charakterisierung mechanischer Eigenschaften nassgewickelter CMC- und PMC-Rohre

SCIENTIFIC PUBLICATIONS

Master-Arbeiten / Diplomarbeiten
Master theses / Diploma theses

Gold, L.:
Study of cycling behaviour lithium-ion batteries using micro-CT.
Julius-Maximilians-Universität Würzburg

Jovanovic, D.:
Herstellung und Charakterisierung von stoffschlüssigen Keramik-Verbindungen mittels Hochtemperatur- und Laserstrahlfügen
Hochschule Hof

Knöckel, G.:
Auslegung, Konstruktion und Validierung eines Ofensystems für die Messung des volumetrischen Ausdehnungsverhaltens mittels Computertomographie
Technische Universität Dresden

Lipp, T.:
Konzept für ein gemeinnütziges Institut der angewandten Forschung zur externen Verwertung der dort generierten Technologien
Ostbayerische Technische Hochschule Amberg-Weiden

Müller, K.:
Brechungsindexeinstellung des Bindermaterials für lichtstreuende Sol-Gel-Schichten.
Julius-Maximilians-Universität Würzburg

Ottlinghaus, W.:
Einfluss von neuen Matrix-Systemen auf die mechansichen Eigenschaften von im Faserwickelverfahren hergestellten C/SiC-Materialien
Hochschule Hof

Zietkowski, M.:
Herstellung und Charakterisierung von stoffschlüssigen Keramik- und CMC-Verbindungen unter Verwendung von Parametervariationen beim Laserstrahlfügen
Hochschule Hof

Dissertationen
Doctoral theses

Lorrmann, H.:
Elektrodenkonzepte für Lithium-Ionen-Batterien.
Julius-Maximilians-Universität Würzburg

Müller, T.:
Computergeschütztes Materialdesign: Mikrostruktur und elektrische Eigenschaften von Zirkoniumdioxid-Aluminiumoxid Keramiken
Julius-Maximilians-Universität Würzburg

Schmitt, V.:
Effect of Dopans on the Local Atomic Structure and Sintering Behavior of Bismuth Sodium Titanate
Universität Bayreuth

Schott, M.:
Neuartige Elektrodenmaterialien auf der Basis von Metallo-Polyelektrolyten und Hybridpolymeren für elektrochrome Fenster
Julius-Maximilians-Universität Würzburg

WISSENSCHAFTLICHE VERÖFFENTLICHUNGEN

Wissenschaftliche Veröffentlichungen
Scientific Publications

Amberg-Schwab S., Weber U., Noller K., Kucukpinar E., Miesbauer O.: Barrier Films for Technical applications, 11th Annual Conference & Tradeshow, Printed Electronics Europe 2015.

Amberg-Schwab S., Collin D., Schwaiger J.: Protection for Bioplastics – biodegradable hybrid lacquers improve durability and barrier properties, in European Coatings Journal, 12, 2015, 32-36

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Holländer A., Amberg-Schwab S., Miesbauer O., Noller K., Process control for thin organic coatings using fluorescence dyes, Progress in Organic Coatings 88, 71-74, 2015

Kilo, M., Rist, T.: Neue Biegeprozesse für die Zukunft | Glaswelt 11 (2015) 90-91

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Nöth, A.; Rüdinger, A.; Pritzkow, W.: Oxide Ceramic Matrix Composites – Manufacturing, Machining, Properties and Industrial Applications. Ceramic Applications 3 (2015)

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Ruess F., Kücükpinar E., Fahlteich J., Amberg-Schwab S., Holländer A.: Inline determination of crosslinking degree via UV excited optical measurement system. Proceedings 9th International Symposium on Flexible Organic Electronics (ISFOE 16), 4-7 July 2016, Thessaloniki, Greece

Scheurell, K., Kemnitz, E., Garcia-Juan, Placido, Eicher, J., Lintner, B., Hegmann, J. Jahn, R., Hofmann, T., Löbmann, P.: Porous MgF_2 antireflective $\lambda/4$ films prepared by sol-gel processing: comparison of synthesis approaches.
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Schott, M., Beck, M., Winkler, F., Lorrmann, H., Kurth, D. G.:
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Seifert, G.; Schmitt, V.; Raether, F.: New Techniques for the Determination of Refractory Material Properties at High Temperatures.
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Stichel, T., Hecht, B., Houbertz, R. & Sextl, G.: Compensation of spherical aberration influcences for two-photon polymerization patterning of large 3D scaffolds.
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DOI 10.1007/s00339-015-9407-6 (2015)

SCIENTIFIC PUBLICATIONS

LEHRTÄTIGKEIT

Lehrtätigkeit
Teaching activities

Julius-Maximilians-Universität Würzburg
Lehrstuhl für Chemische Technologie der Material-synthese; Lehrstuhlinhaber: Prof. Dr. Gerhard Sextl

Vorlesungen/Praktika Wintersemester 2014/15
Löbmann, P.
- Sol-Gel-Chemie II: Schichten und Beschichtungstechnik

Sextl, G., Staab, T.
- Materialwissenschaften I (Struktur, Eigenschaft und Anwendungen von anorganischen Werkstoffen)

Staab, T.
- Eigenschaften moderner Werkstoffe: Experimente & Simulation

Vorlesungen/Praktika Sommersemester 2015
Löbmann, P.
- Sol-Gel-Chemie I: Grundlagen

Sextl, G., Löbmann, P.
- Materialwissenschaften II (Die großen Werkstoffgruppen)

Staab, T.
- Technologie sensorischer und aktorischer Materialien

Technische Universität Clausthal
Vorlesungen Wintersemester 2014/15
Kilo, M.
- Hochleistungsmaterialien: Physikalisch-Chemische Eigenschaften und Anwendungen

Vorlesungen Sommersemester 2015
Kilo, M.
- Werkstoffe für Halbleiter

Georg-Simon-Ohm-Hochschule Nürnberg
Vorlesungen Sommersemester 2015
Kilo, M.
- Werkstofftechnik Glas

Technische Universität Darmstadt
Vortrag Wintersemester 2014/15
Kilo, M.
- Glas und Glastechnologie

Universität Leiden – Leiden Institute of Physics
Vorlesungen Wintersemester 2014/15 und Sommersemester 2015
Heinrich, D.
- Physics of Life
- Advanced Biophysics

Universität zu Köln
Vorlesungen Sommersemester 2014
Mandel, K.:
- Small particles technology

Universität Erlangen-Nürnberg
Vorlesungen Wintersemester 2014/15
Stauber, R.
- Werkstoffe und Erprobung im Automobilbau

TEACHING ACTIVITIES

Technische Universität Braunschweig

Vorlesungen Wintersemester 2014/15
Stauber, R.
- Werkstoffe im Automobilbau

Vorlesungen Sommersemester 2015
Stauber, R.
- Erprobung und Betriebsfestigkeit im Automobilbau

Hochschule für Angewandte Wissenschaften Hof
Vorlesungen und Praktika Sommersemester 2015
Ficker, F.
- Technische Textilien – Webwaren
- Textile Armierungsstrukturen

Universität Bayreuth
Vorlesungen und Praktika Wintersemester 2014/15 und Sommersemester 2015
Hausherr, J. M.
- Zerstörungsfreie Prüftechniken

WISSENSCHAFTLICHE KOOPERATIONEN

Wissenschaftliche Kooperationen mit Hochschulen
Scientific cooperations with universities

Academy of Fine Arts, Faculty of Art Conservation, Krakau (PL)

AGH-University of Science and Technology, Krakau (PL)

Albert-Ludwigs-Universität Freiburg

Aristotle University of Thessaloniki (GR)
- Lab for Thin Films
- Nanosystems and Nanotechnology

Bauhaus-Universität Weimar, Fakultät Bauingenieurwesen, Professur Bauchemie

Chalmers University of Technology, Göteborg (S)
- Department of Chemical and Biological Engineering

Charité Campus Benjamin Franklin, Berlin

Chulalongkorn University Bangkok (THAI)

Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali, Pisa/Firenze (I)

Czech Technical University, Prag (CZ)
- Faculty of Mechanical Engineering

Danmarks Tekniske Universitet (DK)

Donau Universität, Krems (A)

Ecole Nationale Supérieure de Céramique Industrielle, Limoges Cedex (F)

Ecole Polytechnique Federale Lausanne (CH)

Eidgenössische Technologische Hochschule ETH, Zürich (CH)

Friedrich-Schiller-Universität Jena

Ghent University (B)
- Department of Geology and Soil Science
- IMEC Center for Microsystems Technology

Glasgow Caledonian University (UK)

Gotland University, Department of Building Conservation, A Baltic Sea Region Network on Indoor Climate in Churches, Visby (S)

Hochschule Anhalt, Medizinischer Gerätebau

Hochschule Aschaffenburg

Hochschule Emden

Hochschule Offenbach

Hochschule Osnabrück

Hochschule Potsdam
- Studiengang Restaurierung, Studienrichtung Metallkonservierung

Hochschule Würzburg-Schweinfurt-Aschaffenburg, Technologietransferzentrum Elektromobilität (TTZ-EMO)
- Fachbereich Informatik
- Fachbereich Kunststofftechnik

Humboldt-Universität zu Berlin, Institut für Chemie
Imperial College London (UK)
- Physics

SCIENTIFIC COOPERATIONS

Institut National Polytechnique de Grenoble, Laboratoire SIMAP (Science et Ingénierie des Materériaux et Procédés) Saint Martin d'Heres (F)

Institute Electronic Structure and Laser, Foundation for Research and Technology, Holography Lab – Laser Applications, Heraklion (GR)

Julius-Maximilians-Universität Würzburg
- Experimentelle Physik V – Biophysik
- Experimentelle Physik VI – Energy Research
- Lehrstuhl für Funktionswerkstoffe der Medizin und Zahnheilkunde
- Lehrstuhl für Klassische Archäologie
- Lehrstuhl für Materialsynthese
- Lehrstuhl für Technische Physik

Justus Liebig Universität Giessen

Katholieke Universiteit Leuven (B)

Korea University, Sejong Campus

Leibniz Universität Hannover

Leiden University
- Institute of Physics, Leiden (NL)

Linköping University (S)
- Department of Physics and Measurement Technology, Biology and Chemistry

London School of Economics & Political Science, Grantham Research Institute on Climate Change and Environment (UK)
Ludwig-Maximilians-Universität München
- Chemie und Pharmazie

Lulea Tekniska Universitet (S)

McGill University Montreal (CAN)

Medizinische Hochschule Hannover, Klinik für Zahnärztliche Prothetik und Biomedizinische Werkstoffkunde

MPI Biochemie, Martinsried

MPI für Physik komplexer Systeme, Dresden

MPI für Eisenforschung GmbH MPIE, Düsseldorf

Nagoya University, National Institute of Advanced Industrial Science and Technology AIST, Nagoya (JP)

National Technical University of Athens (GR)
- School of Mechanical Eng., Lab. of Heterogeneous Mixtures & Combustion Systems
- School of Civil Engineering, Lab. for Earthquake Engineering

Otto-Friedrich-Universität Bamberg
- Institut für Archäologie, Denkmalkunde und Kunstgeschichte

Paris-London-Universität Salzburg (A)
- Fachbereich Materialwissenschaften und Physik

Philipps-Universität Marburg
- Institut für Anorganische Chemie

Polytecnio di Torino (I)

Rheinisch Westfälische Technische Hochschule (RWTH) Aachen
- Institut für Elektrochemische Energiewandlung und Speichersystemtechnik
- Institut für Gesteinshüttenkunde
- Institut für Physikalische Chemie
- Institut für Werkstoffanwendungen
- Klinik für Plastische Chirurgie, Hand- und Verbrennungschirurgie

WISSENSCHAFTLICHE KOOPERATIONEN

Risø Technical University of Denmark DTU (DK)

Risø National Laboratory for Sustainable Energy, Roskilde (DK)

Sächsisches Textilforschungsinstitut e.V. an der TU Chemnitz

Sandia Nationals Labs, CA (USA)

Tampere University of Technology, Tampere (FIN)
- Department of Energy and Process Engineering, Paper Converting and Packaging Technology

Technical University of Denmark, Department of Management Engineering, Kongens Lyngby (DK)

Technische Universität Bergakademie Freiberg
- Institut für Automatisierungstechnik,
- Institut für Mechanische Verfahrenstechnik und Aufbereitungstechnik

Technische Universität Berlin

Technische Universität Braunschweig

Technische Universität Darmstadt

Technische Universität Dresden
- Institut für Festkörperelektronik
- Institut für Angewandte Photophysik
- Institut für Physikalische Chemie

Technische Universität Graz (A)
- Institut für Chemische Technologie von Materialien

Technische Universität Kassel

Technische Universität München
- Studiengang für Restaurierung, Kunsttechnologie und Konservierungswissenschaft
- Lehrstuhl für Elektrische Energiespeichertechnik (EES)

Technische Universität Wien (A)
- Institut für Angewandte Synthesechemie
- Institut für Nachrichten- und Hochfrequenztechnik

Technische Universiteit Eindhoven (NL)
- Department Technology, Unit Building Physics and Systems
- Department of Applied Physics (Plasma and Materials Processing)

The Royal Danish Academy of Fine Arts, Kopenhagen (DK)
- The School of Conservation

Tokyo Institute of Technology (JP)

Tokyo University of Agriculture and Technology, Ohno-Lab (JP)

Trinity College Dublin (IRE)

Universität Alicante (E)

University of Applied Sciences Northwestern Switzerland, Basel (CH)
- School of Life Sciences

Universität Augsburg
- Anwenderzentrum Material- und Umweltforschung

Universitat Autònoma de Barcelona (E)
- Instituto de Ciencia de Materiales

Universität Bayreuth
- Bayerisches Geoinstitut
- Lehrstuhl Keramische Werkstoffe
- Lehrstuhl für Werkstoffverarbeitung

SCIENTIFIC COOPERATIONS

University of Birmingham (UK)

Université Bordeaux (F)

Universität Bremen

University of Chalmers Göteborg (SE)

Universität Erlangen-Nürnberg
- Institut für Werkstoffwissenschaften
- Lehrstuhl Werkstoffe der Elektrotechnik

Università di Genova (I)

University of Glasgow (UK)
- The Kelvin Nanocharacterisation Centre

Universität Hannover
- Institut für Anorganische Chemie

Université de Haute-Alsace, Mulhouse-Colmar (F)
- Département de Photochimie Générale CNRS-UMR 7525

University of Huddersfield (UK)

Universität Innsbruck (A)

University of Ioannina (GR)
- Department of Materials Science and Engineering

Universitat Jaume I, Castelló (E)
- Group of Photovoltaic and Optoelectronic Devices

Universität Jena
- Institut für Angewandte Physik

Universität Konstanz

Universität zu Köln
- Lehrstuhl für Anorganische Chemie

University of Leeds (UK)
- Nanomanufacturing Institute

Universität Leipzig
- Fakultät für Chemie und Mineralogie
- Institut für Technische Chemie

Universität Linz
- Institute of Applied Physics

University of Ljubljana (SLO)
- Faculty of Civil and Geodetic Engineering, Chair for Research in Materials and Structures

University of London, Birkbeck College (UK)

University of Manchester (UK)

Università Milano-Bicocca, Mailand (I)

University of Oxford (UK)
- Department of Materials

Università di Padova (I)
- Dipartimento di Scienze Chimiche

University of Patras (GR)
- Department of Civil Engineering, Structural Materials Laboratory
- Department of Chemistry

University of Pisa (I)
- Department of Chemistry and Industrial Chemistry

Université Pierre et Marie Curie, Paris (F)

WISSENSCHAFTLICHE KOOPERATIONEN

Universität Regensburg

Universität Rostock
- Institut für Biomedizinische Technik
- Kompetenzzentrum für Biomaterialien
- Medizinische Fakultät, Institut für Biomedizinische Technik
- Poliklinik für Zahnärztliche Prothetik und Werkstoffkunde

Universität Saarbrücken

Universität Salzburg
- Fachbereich Materialforschung und Physik

University of Sheffield (UK)

University of Surrey (UK)
- Advanced Technology Institute

Universität Stuttgart
- Institut Polymerchemie

Université de Technologie de Belfort-Montbéliard (F)

Université de Technlogie de Troyes (F)

Universiti Teknologi Malaysia UTM (MYS)

University of Twente (NL)
- Department of Civil Engineering

Universität Ulm
- Abt. Anorganische Chemie I

Universitat de Valencia (ES)
- Institute Ciencia Molecular

Universitätsklinikum Würzburg
- Augenklinik und Poliklinik
- HNO-Klinik

University of Zagreb (CRO)
- Faculty of Civil Engineering

Warsaw University (PL)
- Laboratory of Electrochemical Power Sources

West Pomeranian University of Technology, Szczecin (PL)
Westfälische Wilhelms-Universität Münster
- Institut für Anorganische und Analytische Chemie

Yonsei University Seoul (KO)

- Zachodniopomorski Uniwersytet Technologiczny w Szczecinie (PL)

SCIENTIFIC COOPERATIONS

Wissenschaftliche Kooperationen mit anderen Forschungseinrichtungen
Scientific cooperations with other research institutions

Acreo AB, Printed Electronics Group and Interconnect and Packaging Group, Norrköping (S)

Akademie der Wissenschaften der Tschechischen Republik, Prag (CZ)
- Institute of Radio Engineering and Electronics
- Institute of Chemical Process Fundamentals

Arbeitsgemeinschaft industrieller Forschungsvereinigungen »Otto von Guericke« e.V., Köln

Bundesanstalt für Materialforschung und -prüfung BAM, Berlin

Center for Documentation of Cultural & Natural Heritage, Giza (ET)

Center for Organic Chemistry, Pardubice (CZ)

Centro de Tecnologías Electroquímicas, San Sebastián (E)

Centrum Organicke Chemie SRO, Zybitivi (CZ)

Cercle des Partenaires du Patrimoine, Laboratoire de Recherche des Monuments Historiques, Champs sur Marne (F)

Commissariat à l'énergie atomique CEA, Laboratoire d'Électronique des Technologies de l'Information (Leti), Grenoble (F)

Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali, Firenze (I)

Consorzio Venezia Ricerche, Venezia (I)

Deutsche Bundesstiftung Umwelt (DBU)

Deutsches Kunststoff-Institut, Darmstadt

Deutsches Zentrum für Luft- und Raumfahrt DLR, Stuttgart und Köln
- Institut für Technische Thermodynamik

Dombauamt Erfurt, Glaswerkstatt

EASN Technology Innovation Services BVBA, Budingen (B)

Eidgenössische Materialprüfungs- und Forschungsanstalt (EMPA), Zürich (CH)

EU-COST MP1202 Interfaces

Europäisches Feuerfestzentrum ECREF, Höhr-Grenzhausen

Flemish Institute for Technological Research (VITO), Mol (B)

Forschungsallianz Kulturerbe (FALKE)

Forschungsgemeinschaft Feuerfest e.V., Bonn

Forschungsgemeinschaft Technik und Glas e.V., Wertheim

Forschungskuratorium Textil e. V., Berlin

Forschungszentrum Jülich
- Geschäftsbereich Energietechnologien

Fundacion Andaluza para el Desarollo Aerospacial, Sevilla (E)

Fundacion TEKNIKER, Eibar (E)

Glasrestaurierungswerkstatt der Dombauhütte Köln

WISSENSCHAFTLICHE KOOPERATIONEN

Gradbeni Institut ZRMK
- Centre for Indoor Environment, Building Physics and Energy, Ljubljana (SLO)

Helmholtz-Zentrum Berlin

Hüttentechnische Vereinigung der Deutschen Glasindustrie HVG, Offenbach

Institute of Molecular Sciences University of Bordeaux (F)

Institut de Recherche d'HydroQuébec (IREQ), Montreal (CAN)

Institut für Bioprozess- und Analysenmesstechnik e. V., Heiligenstadt

Institut für Diagnostik und Konservierung an Denkmalen in Sachsen und Sachsen-Anhalt, Halle/Saale

Institut für Energie- und Umwelttechnik (IUTA), Duisburg

Institut für Fertigteiltechnik und Fertigbau Weimar e.V.

Institut für Klinische Hygiene und Qualitätssicherung e. V. (IKHQ), Köthen

Institut für Korrosionsschutz Dresden GmbH, Dresden

Institut für Luft- und Kältetechnik GmbH, Dresden

Institut für Photonische Technologie e.V., Jena

Institut polytechnique de Grenoble (INP), Grenoble (F)

Instituto di Scienze dell'atmosfera e del Clima, Consiglio Nazionale Delle Ricerche, Rom (I)

Italian National Research Council (IT)
- Institute for Physical and Chemical Processes, Bari
- Water Research Institute, Bari
- Institute of Inorganic Chemistry and Surface (ICIS), Padova

Joanneum Research Forschungsgesellschaft mbH, Graz (A)

Jožef Stefan Institute, Ljubljana (SLO)
- Department of Surface Engineering and Optoelectronics

King Abdulaziz City for Science and Technology (KACST)

Karlsruher Institut für Technologie (KIT)
- Institut für Werkstoffe der Elektrotechnik
- Institut für Angewandte Materialien

Max-Planck-Institut für Eisenforschung, Düsseldorf

Max-Planck-Institut für Meteorologie, Hamburg

Max-Planck-Institut für Plasmaphysik, Garching

Max-Planck-Institut für Polymerforschung, Mainz

MRB - Research Center for Magnetic Resonance Bavaria e.V.

National Institute of Chemistry, Ljubljana (SLO)

Nederlandse organisatie voor toegepast natuurwetenschappelijkonderzoek (TNO)

Norwegian Institute for Air Research, Kjeller (N)

Research Center on Nanoscience and Nanotechnology, CIN2: CSIC-ICN, Bellaterra-Barcelona (E)

SIMaP (Materials and Processes Science and Engineering Laboratory), Martin de Heres Cedex (F)

SCIENTIFIC COOPERATIONS

Staatliche Museen Preußischer Kulturbesitz, Berlin

Swiss Research Centre for Stained Glass and Glass Art,
Romont (CH)

The Cathedral Studios, The Chapter of Canterbury Cathedral,
Canterbury (UK)

Teknologian Tutkimuskeskus VTT, Espoo (FIN)

VTT Technical Research Centre of Finland, Tampere (FIN)

Zentrum für Sonnenenergie- und Wasserstoffforschung, Ulm

Zentrum für Innovationskompetenz »Virtuelle Hochtemperatur-
Konservierungsprozesse – Virtuhcon«,
an der TU Bergakademie Freiberg, Freiberg

VERANSTALTUNGEN DES FRAUNHOFER ISC

EVENTS AT THE FRAUNHOFER ISC

Gastreferenten des ISC-Seminars in Würzburg
Guest speakers at the Fraunhofer ISC

21. Januar 2015
Multidimensional dynamic imaging from single cells to single molecules, Dr. Franz-Josef Schmitt
Institute of Chemistry, Biophysical Chemistry, TU Berlin

13. Februar 2015
The Programme Horizon 2020 and the activities performed at CENIMAT/I3N open to the world
Prof. Dr. Rodrigo Martins
New University of Lisbon, Portugal
Director of the Centre of Excellence in Microelectronics and Optoelectronics Processes of Uninova
Head of Materials Science Department CENIMAT/I3N

12. Juni 2015
Wege zu operativer Excellence bei Evonik
Dr. Harald Hoecker
Evonik Industries AG, Operational Excellence, Hanau-Wolfgang

8. Juli 2015
Dendritic grafting of surfaces for catalysis and biotechnology applications
Karine Heuze
Université de Bordeaux - CNRS

20. Juli 2015
Materialentwicklung aus der Datenwolke: Durch Textmining über Nacht zum Stand der Technik
Dr. Wolfgang Grond
Numberland, Ingenieurbüro für Prozesse und Werkstoffe, Kulmbach

31. Juli 2015
Nanoporous Ultra-thin Membranes formed via Self-Assembly of Protein-Polymer-Conjugates
Prof. Dr. Alexander Böker
Fraunhofer IAP (Institutsleiter), Lehrstuhl für Polymermaterialien und Polymertechnologien, Potsdam

14. September 2015
Exploiting Colloidal Self-Assembly: From Simple Building Blocks to Functional Materials
Prof. Dr. Nicolas Vogel
Institute of Particle Technology, Cluster of Excellence – Engineering of Advanced Materials, Friedrich-Alexander-University Erlangen-Nürnberg

28. Oktober 2015
Tissue Enginierte Gewebe-Äquivalente für den klinischen Einsatz und den Ersatz zum Tierversuch
Dr. Florian Groeber
Translationszentrum Würzburg, 'Regenerative Therapien für Krebs- und Muskuloskelettale Erkrankungen', Institutsteil des Fraunhofer-Instituts für Grenzflächen- und Bioverfahrenstechnik

Veranstaltungen am Fraunhofer ISC
Conferences and events at the Fraunhofer ISC

Landesgartenschau Alzenau ab dem 22. Mai 2015

Würzburger Wirtschaftstage
Würzburg, 24. Februar 2015

Workshop »Innovations in Lead-Acid Batteries – Europe«
Würzburg, 15.-17. April 2015

Girls' Day,
Würzburg, 23. April 2015

Workshop »Smart Materials: Von der Vision zur Anwendung«
Würzburg, 5. Mai 2015

Abschlusskonferenz »ABattReLife«
Würzburg, 11. Juni 2015

MESSEN UND AUSSTELLUNGEN
FAIRS AND EXHIBITIONS

Überraschungskolloquium Verabschiedung Dr. Rolf Ostertag
Würzburg, 17. Juli 2015

Einweihung neues Forschungsgebäude des Fraunhofer-Zentrum HTL
Bayreuth-Wolfsbach, 28. Juli 2015

EIT Raw Materials – Brokerage Event on Substitution
Würzburg, 3.-4. September 2015

Workshop »Glas und Architektur«
Würzburg, 7. Oktober 2015

17. Zellerauer Kulturtage
Würzburg, 8.-11. Oktober 2015

4. EnergieDialog Mainfranken
Würzburg, 26. Oktober 2015

Messen und Ausstellungen
Fairs and exhibitions

Internationale Grüne Woche
Berlin, 15.-25. Januar 2015

nano tech
Tokyo (Japan), 28.-30. Januar 2015

ICE Internationale Converting Fachmesse
München, 10.-12. März 2015

Hannover Messe
Hannover, 13.-17. April 2015

European Coatings Show
Nürnberg, 21.-23. April 2015

IDTechEX – Printed Electronics Europe
Berlin, 28.-29. April 2015

BIT Berufsinformationstag
Würzburg, 9. Mai 2015

Sensor + Test
Nürnberg, 19.-21. Mai 2015

Wertheimer Regionaltag
Wertheim, 7. Juni 2016

Achema – Weltforum und Internationale Leitmesse der Prozessindustrie
Frankfurt, 15.-19. Juni 2015

WITE Conference »Strategies in Tissue Engineering«
Würzburg, 10.-12. Juni 2015

Thermprocess – Internationale Fachmesse für Thermoprozesstechnik
Düsseldorf, 16.-20. Juni 2015

International Rubber Conference
Nürnberg, 29. Juni – 2. Juli 2015

Zukunftsforum Industrie 4.0
Würzburg, 8. Juli 2015

UNITECR – Unified International Technical Conference on Refractories
Wien (Österreich), 15.-18. September 2015

Main Franken Messe
Würzburg, 26.-27. September 2015
CeramiTec
München, 20.-23. Oktober 2015

Schaeffler Hausmesse »Open inspiration«
Herzogenaurach, 4. November 2015

IDTechEX – Printed Electronics USA
Santa Clara (CA, USA), 18.-19. November 2015

MITGLIEDSCHAFTEN

Mitgliedschaften und Mitarbeit in Gremien
Activities in associations and committees

Academy of Dental Materials

Advanced Lead Acid Battery Consortium (ALABC)

AMA Fachverband für Sensorik e.V.

American Ceramic Society

A.SPIRE European Association

AVK e. V.

Bayern Photonics e. V.

Bayerische Cluster:
Chemie | Medizintechnik | Nanotechnologie
Neue Werkstoffe | Mechatronik & Automation

Bundesverband Energiespeicher e.V. (BVES)

Bundesverband mittelständische Wirtschaft (BVMW)

Carbon Composites e.V.

DECHEMA e.V.

Deutsche Glastechnische Gesellschaft e.V. (DGG)

Deutsche Keramische Gesellschaft e. V. (DKG)

Deutsche Mineralogische Gesellschaft e.V. (DMG)

DGM-Fachausschuss »Werkstoffe der Energietechnik«

Deutsche Phosphor-Plattform (DPP)

Deutsches Verpackungsinstitut e. V. (dvi)

Electrochemical Society

Europa Nostra

European Bioplastics e. V.

European Multifunctional Materials Institute (EMMI)

European Rare Earth Competency Network (ERECON)

European Technology Platform on Smart Systems Integration (EPoSS)

Firmenausbildungsverbund e.V. (FABI), Main-Tauber

Forschungsgemeinschaft Technik und Glas e.V. (FTG)

Forum MedTech Pharma e.V.

Förderung Wissenschaftlicher Nachwuchs:
Netzwerk WISSEN² (Junge Forscherinnen und Forscher Würzburg)

Gemeinschaftsausschuss Hochleistungskeramik der Deutschen Keramischen Gesellschaft DKG und der Deutschen Gesellschaft für Materialkunde DGM
- Arbeitsgruppe Keramische Schichten
- Arbeitsgruppe Verstärkung keramischer Werkstoffe
- Arbeitsgruppe Polymerkeramik
- Arbeitsgruppe Ausgangspulver

Gesellschaft Deutscher Chemiker (GDCh)
- Arbeitsgruppe Chemie am Bau
- Fachgruppe Anstrichstoffe und Pigmente
- Fachgruppe Angewandte Elektrochemie

ACTIVITIES IN ASSOCIATIONS AND COMMITTEES

Gesellschaft für Umweltsimulation e. V. (GUS)

Gesellschaft Mess- und Automatisierungstechnik (GMA)
- Fachausschuss 4.16 Unkonventionelle Aktorik

Gesellschaft für Korrosionsschutz e.V. (GfKORR)
- Arbeitskreis Korrosionsschutz in der Elektronik und Mikrosystemtechnik

ICOMOS Deutsches Nationalkomitee / ICOMOS International

Innovation + Technik GmbH (VDI/VDE-IT)

IHK Fachausschuss Industrie, Technologie und Forschung

International Lead Zinc Research Organization

Informationsdienst Wissenschaft (idw)

Initiative Junge Forscherinnen und Forscher e.V. (IJF)

Initiative Nano-in-Germany

International Advisory Board of Journal of Sol-Gel-Science and Technology

International Conference on Coatings on Glass and Plastics (ICCG) | Programm-Ausschuss

International Sol-Gel-Society (ISGS)

Materials Research Society

Materials Valley e.V. – Kompetenznetzwerk für Materialforschung und Werkstofftechnik

mst – Netzwerk Rhein-Main e.V. – Kompetenznetzwerk Mikrosystemtechnik

Munich Network e.V.

NanoMat – Netzwerk Nanomaterialien

NanoMikroWerkstoffePhotonik e.V. – NMWP.NRW

Nanonetz Bayern e.V.

Organic and Printed Electronics Association (OE-A)

ProcessNET | Fachgruppe Nanotechnologie

smart³ e. V.

Umweltcluster Bayern

Verband Deutscher Maschinen- und Anlagenbau (VDMA)

Zentrum für Telematik e. V.

ALLIANZEN UND NETZWERKE

Das Institut in Netzwerken

Das Fraunhofer ISC ist aktives Mitglied in zahlreichen nationalen und internationalen Forschungsnetzwerken. Ziel der Kooperationen ist es, den interdisziplinären Wissensaustausch mit der Industrie und anderen universitären und außeruniversitären Forschungseinrichtungen zu fördern, die eigene Kompetenz einzubringen und neue Partner zu gewinnen.

Als Materialentwicklungsinstitut gehört das Fraunhofer ISC dem Fraunhofer-Verbund Materials an. Vorsitzender ist Prof. Dr.-Ing. Peter Elsner, Leiter des Fraunhofer ICT. Weitere Mitglieder sind die Fraunhofer-Institute EMI, IAP, IBP, IFAM, IGB, IKTS, ISE, ISI, ITWM, IWM, IZFP, LBF und WKI. Innerhalb der Fraunhofer-Gesellschaft führt ein Mitarbeiter des Fraunhofer ISC die Geschäftsstelle der Allianz »Nanotechnologie«. Auf Geschäftsbereichsebene bestehen zusätzlich eine Reihe weiterer enger Kooperationen mit den Fraunhofer-Allianzen »AdvanCer«, »Adaptronik«, »Batterien«, »Energie«, »Leichtbau«, »Numerische Simulation von Produkten und Prozessen«, »Polymere Oberflächen – POLO« und »Photokatalyse« sowie mit zahlreichen Universitäten und Forschungsinstituten außerhalb der Fraunhofer-Gesellschaft, beispielsweise in der »Forschungsallianz Kulturerbe«, oder im »Wilhelm Conrad Röntgen Research Center for Complex Material Systems« (RCCM) an der Julius-Maximilians-Universität Würzburg.

Auf nationaler Ebene engagiert sich das Fraunhofer ISC in einer Reihe von Bayerischen Innovationsclustern, im Kompetenznetz für Materialien der Nanotechnologie (NanoMat), im Kompetenznetzwerk für Materialforschung und Werkstofftechnik Materials Valley e.V. und in der Deutschen Phosphor-Plattform DPP sowie auf europäischer Ebene im »European Mulitfunctional Materials Institute (EMMI). Mit seiner Projektgruppe IWKS ist das Fraunhofer ISC darüber hinaus in das »German Resource Research Institute« (GERRI) und in die europäische Knowledge and Innovation Community (KIC) »EIT - Raw Materials« eingebunden.

The Institute in Networks

The Fraunhofer ISC holds active memberships in a number of national and international research networks to promote the interdisciplinary exchange with university and other research institutions and the industry. The obvious benefit is to share competencies and to attract new partnerships.

As a materials development institute, the Fraunhofer ISC is a member of the Fraunhofer Materials Group. The Group's spokesman is Prof. Dr.-Ing. Peter Elsner, Director of the Fraunhofer ICT. Other members are the Fraunhofer Institutes EMI, IAP, IBP, IFAM, IGB, IKTS, ISE, ISI, ITWM, IWM, IZFP, LBF and WKI.

Under the roof of the Fraunhofer Gesellschaft, a Fraunhofer ISC employee is managing director and deputy spokesman of the Fraunhofer Nanotechnology Alliance. The Fraunhofer ISC is further involved in cooperations with the Fraunhofer Alliances »AdvanCer«, »Adaptronics«, »Batteries«, »Energy«, »Lightweight Construction«, »Numeric Simulation of Products and Processes«, »Polymer Surfaces – POLO« and »Photocatalysis«.

The Fraunhofer ISC is also active in external research networks, e. g. in the »Forschungsallianz Kulturerbe« and the »Wilhelm Conrad Röntgen Research Center for Complex Material Systems« (RCCM) of the Würzburg University.

On a national scale, the Fraunhofer ISC is engaged in a number of Bavarian innovation clusters, in a competence network for nanotechnology materials (NanoMat) and one for materials research and technology (Materials Valley e.V.) as well as in the German Phosphorous Platform DPP. On a European scale, the Fraunhofer ISC is a partner in the »European Multifunctional Materials Institute« (EMMI). By way of the Project Group IWKS, Fraunhofer ISC is also partnering the »German Resource Research Institute« (GERRI) and the European Knowledge and Innovation Community (KIC) »EIT - Raw Materials«.

ALLIANCES AND NETWORKS

Kontakte
Contacts

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Forschungsallianz Kulturerbe
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Deutsche Phosphor Plattform – DPP
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Chemie Cluster Bayern GmbH
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Nanoinitiative Bayern GmbH – Cluster Nanotechnologie
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Cluster der Allianz Bayern Innovativ – Cluster Neue Werkstoffe
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