

FRAUNHOFER IKTS IN PROFILE

PORTRAIT



The Fraunhofer Institute for Ceramic Technologies and Systems IKTS covers the field of advanced ceramics from basic preliminary research through to the entire range of applications. Superbly equipped laboratories and technical facilities covering 30,000 m² of useable space have been set up for this purpose at the sites in Dresden and Hermsdorf. Based on comprehensive materials expertise in advanced ceramic materials, the institute's development work covers the entire value creation chain, all the way to prototype production. Fraunhofer IKTS forms a triad of materials, technology and systems expertise, which is enhanced by the highest level of extensive materials diagnostics for materials beyond ceramics. Chemists, physicists, materials scientists and engineers work together on an interdisciplinary basis at IKTS. All tasks are supported by highly skilled technicians.

The focus is placed on manufacturers and especially existing and potential users of ceramics as project partners and customers. Fraunhofer IKTS operates in nine market-oriented divisions in order to demonstrate and qualify ceramic technologies and

components as well as non-destructive test methods for new industries, product ideas and markets outside the traditional areas of use.

The focus is on the challenges facing society as a whole in the area of new forms of mobility, sustainable concepts for energy and water technologies as well as efficient digital production for which Fraunhofer IKTS integrates tried-and-tested and new materials, technology and systems concepts. They are used in the business divisions Mechanical and Automotive Engineering, Electronics and Microsystems, Energy, Water, Environmental and Process Engineering, Bio- and Medical Technology as well as Non-Destructive Testing and Monitoring. In the cross-sectional divisions of Materials and Processes as well as Material and Process Analysis, established and new technologies are continuously being further developed as "enabling technologies" for all other fields.

Among our unique areas of expertise, we offer:

End-to-end production lines: from starting materials to prototypes

For any class of ceramic materials, Fraunhofer IKTS has access to all the standard processes of raw materials preparation, forming, heat treatment and finish processing. Where it makes sense, the institute can even conduct phase synthesis. In functional ceramics, IKTS holds a particular core competency in paste and tape technology. Multiple clean rooms and low-contamination production areas are kept at the ready, among other things, for multilayer ceramics and highly purified oxide ceramics lines of technology.

Multi-scale development

Fraunhofer IKTS can convert developments from the lab into the technical standard. There is industrially suited equipment and machinery of the latest designs available for all relevant lines of technology, in order for partners and customers to realize the prototypes and pilot-production series needed for market launch, to develop production processes, and to implement quality processes. Thus, residual cost risks and time to market can be minimized.

Competent analysis and quality assessment

High-performance analysis and quality control are a decisive factor for market acceptance of products, especially in ceramic production processes. The fundamental understanding of materials and ceramic manufacturing processes in conjunction with the design and integration of complex testing systems enables unique solutions to be found for key material issues in product development, manufacturing and quality assurance.

Synergies between materials, technologies and applications

The targeted combination of different technology platforms, of functional and structural ceramics for example, allows for multifunctional components and systems that intelligently exploit various ceramic properties. Innovative products with significant added value and lower costs can be directly tested, validated and optimized in several application centers.

Network creator

In ongoing projects Fraunhofer IKTS is currently associated with over 450 national and international partners. In addition, IKTS is active in numerous regional, national and international alliances and networks. Thus, the institute is well networked with the Fraunhofer Group for Materials and Components – MATERIALS – as well as with another 11 alliances within the Fraunhofer-Gesellschaft. By building up and actively working within various networks, Fraunhofer IKTS is able to identify and impart complementary competences at an early stage and integrate them for successful product development. In this way, solutions can be found in the interests of our partners far beyond the traditional materials development.

Cross-locational management for sustainable quality assurance

Quality, traceability, transparency and sustainability: to Fraunhofer IKTS, these are the most important tools to provide partners and customers with valid, reproducible and resource-saving research results. The IKTS therefore administers a standardized management system per DIN EN ISO 9001 as well as an environmental management system in accordance with DIN EN ISO 14001. Furthermore, each site of the institute is certified according to additional guidelines, including the German Medical Devices Act, and is regularly subjected to a variety of industrial audits.

CORE COMPETENCIES OF FRAUNHOFER IKTS

MATERIALS AND SEMI-FINISHED PARTS

STRUCTURAL CERAMICS

- Oxide ceramics
- Non-oxide ceramics
- Hardmetals and cermets
- Powders and suspensions
- Polymer ceramics
- Fiber composites
- Composite materials
- Ceramic foam

FUNCTIONAL CERAMICS

- Non-conducting materials
- Dielectrics
- Semiconductors
- Ion conductors
- Magnets
- Pastes and tapes
- Solders, brazes and glass sealings
- Precursor-based inks and nanoinks
- Composites

ENVIRONMENTAL AND PROCESS ENGINEERING

- Substrates**
 - Granules
 - Plates
 - Tubes
 - Capillaries
 - Hollow fibers
 - Honeycombs
 - Foams
- Membranes and filters**
 - Oxides, Non-oxides
 - Zeolites, carbon
 - MOF, ZIF, composites
 - Ion and mixed conductors
- Catalysts**
 - Oxides
 - Metals, CNT

RAW MATERIAL AND PROCESS ANALYSIS, MATERIALS DIAGNOSTICS, NON-DESTRUCTIVE EVALUATION

- Analysis and evaluation of raw materials**
 - Analysis of particles, suspensions and granules
 - Chemical analysis
- In-line process characterization**
 - Ceramic-suitable data acquisition and instrumentation
 - Process simulation and design
 - Quality management

- Characterized materials**
 - Steel, non-ferrous metals
 - Ceramics, concrete
 - Materials of semiconductor industry
 - Plastics, composite materials (GFRP und CFRP)
 - Biomaterials and tissues

Process design, process monitoring

TECHNOLOGY

COMPONENTS AND SYSTEMS

Powder technology

Shaping

Heat treatment and sintering

Final machining

Precursor technology

Fiber technology

Additive manufacturing

Pilot production and upscaling

Coating technology

Joining technology

Component design

Prototype production

Wear-resistant components

Tools

Optical components

Heating systems

Medical device technology and implants

Filters

Thick-film technology

Multilayer

- HTCC, LTCC

Aerosol- and Inkjet-Printing

Thin-film technology

Electrochemical machining

Galvanics

System definition and plant development

Modeling and simulation

Design and prototype production

Validation/CE marking

Test stand construction

Support in field tests

Materials separation

- Filtration, pervaporation
- Vapor permeation
- Gas separation
- Membrane extraction
- Membrane distillation
- Electromembrane processes

Catalysis

Biomass technology

- Preparation
- Conversion

Photocatalysis

Chemical process engineering

Samples and prototypes

- Membranes, filters
- Membrane modules
- Membrane plants

Filtration tests

- Laboratory, pilot, field
- Piloting

Modellierung und Simulation

- Materials transport
- Heat transport
- Reaction

Reactor development

Plant design

Materials and component characterization

- Microstructure and phases
- Mechanical and physical properties
- High-temperature properties
- Corrosion

Component and systems performance

- Damage analysis
- Failure mechanisms
- Measurement and simulation of component behavior
- Testing in accordance with certified and non-certified standards

Technologies

- Non-destructive and destructive test methods
- Micro- and nanoanalytics
- Ultrasound testing
- High-frequency eddy current
- Optical methods
- X-ray methods
- Acoustic diagnosis

Components, systems and services

- Sensors and sensor networks
- Testing heads and systems
- Structural health monitoring
- Data analysis and simulation
- Biomedical sensor systems
- Testing in accordance with certified and non-certified standards

Component performance, reliability analysis, lifetime and quality management, calibration