



# Fraunhofer

IKTS

FRAUNHOFER INSTITUTE FOR  
CERAMIC TECHNOLOGIES AND SYSTEMS IKTS

## CENTER OF COMPETENCE POWDER TECHNOLOGY



# PRODUCT DESIGN

READY-TO-PRESS-POWDER (PREMIX)

POWDER FOR THERMAL CLADDING  
AND SPRAYING

FUNCTIONAL POWDERS AND BEADS

## Development goals

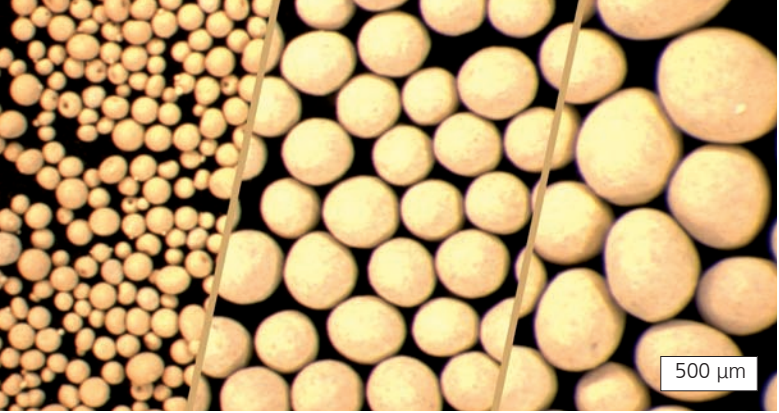
Processing of coarse to nanosized raw materials to disperse products (suspension, bulk) with tailored properties in laboratory and pilot scale in close connection with partners from industry or research.

## Raw materials

- Structural ceramics (silicates, oxides, nitrides, carbides)
- Functional ceramics (glass, titanates, perovskites)
- Metal (ferrites, flakes, alloys, oxides)
- Hardmetals, cermets
- Carbon
- Pigments, colors
- Polymers (compounds)

## Development objectives

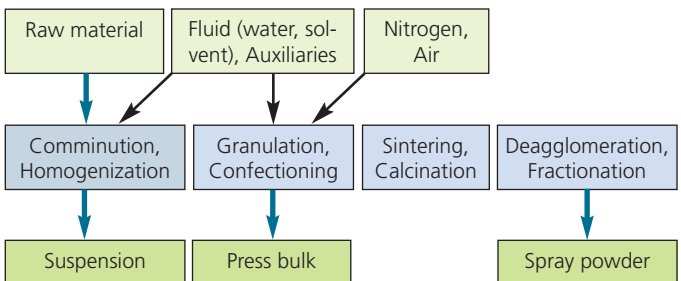
- Stabilization of suspension and slip (dispersant)
- Characterization and processing of nanosized material
- Selection and parameter optimization of milling equipment
- Functionalization of powders by coating
- Tailoring of press bulk (premix) for traditional and nanosized raw materials



- Selection and test of formulation components (binder, lubricant, plasticizer)
- Characterization of the storage behavior (climate, sorption, aging)
- Development of functional beads structure (hollow, dense, graded)
- Development of spray powder for special applications (material composition, structure)
- Influence of flowability on processing

## Technology

Complete routes for the processing of coarse to nanosized materials with high purity and reactivity are available in laboratory and pilot scale in technology area of 530 m<sup>2</sup>. The handling of organic solvents and slips is enabled in explosion proof equipment under inert conditions (nitrogen). Production of larger test batches during the market introduction is offered.



## Comminution

- Dry milling ( $> 2 \mu\text{m}$ , inert)
- Wet milling ( $< 10 \mu\text{m}$ , water, solvent)
- High energy milling

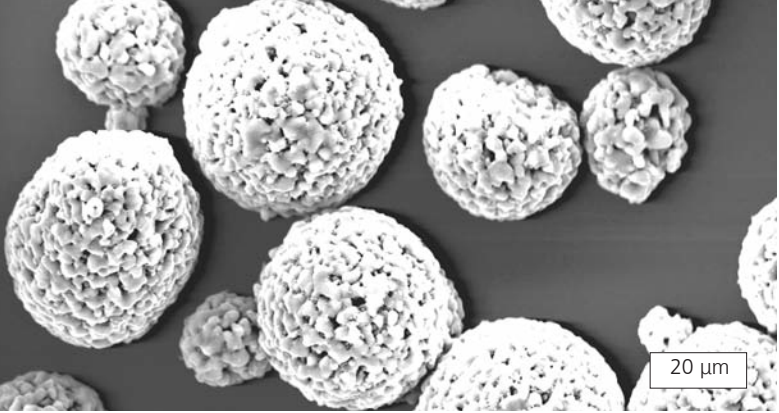
## Granulation / Coating

- Intensive mixer (1-20 l volume)
- Spray dryer (water, solvent, 2-20 kg/h water evaporation)
- Fluidized bed apparatus (agglomeration, layering, coating)
- Wet powder spraying (research unit)
- Sieve units (down to  $20 \mu\text{m}$ , ultrasonic)

## Characterization

Tailored measuring techniques are the key for material and process characterization as well as the functionality of the product. The use of special methods in combination with modelling and simulation tools (DOE, DEM) allows the description of the property change from raw material to disperse product and the quality and process control. Actual methods in development:

- Characterization and design of internal structure of spray granules
- Filling behavior of granules in die pressing
- Conveying characteristic of spray powders



## Particle and suspension characterization

(Accreditation in accordance with DIN EN ISO/IEC 17025)

Particle shape

Electrokinetic

Particle size distribution

Surface tension

Density

Viscosity

Specific surface

pH-value

## Granule characterization

(Laboratory air-conditioned)

Granule size distribution

Granule shape distribution

Deformation behavior

Fracture load distribution

Internal structure

Porosity

Sorption isotherm

Moisture

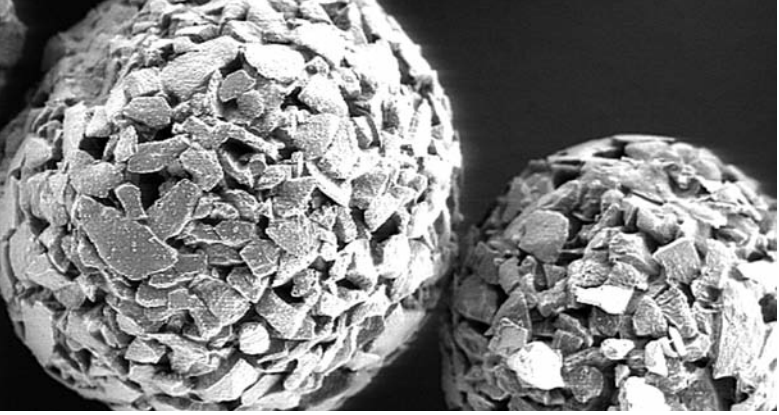
Flowability

Compactibility

## Thermoanalysis

(Accreditation in accordance with DIN EN ISO/IEC 17025)

Complex thermal analysis of material and processes:  
shrinkage, thermal effects, mass loss, gas evolution



## Market partners

Raw material refinement

Glass ceramics

Refractories

Wear protection

Mechanical engineering

Biotechnology

Environmental protection

Tiles production

Chinaware

Cutting industry

Personal protection

Chemical engineering

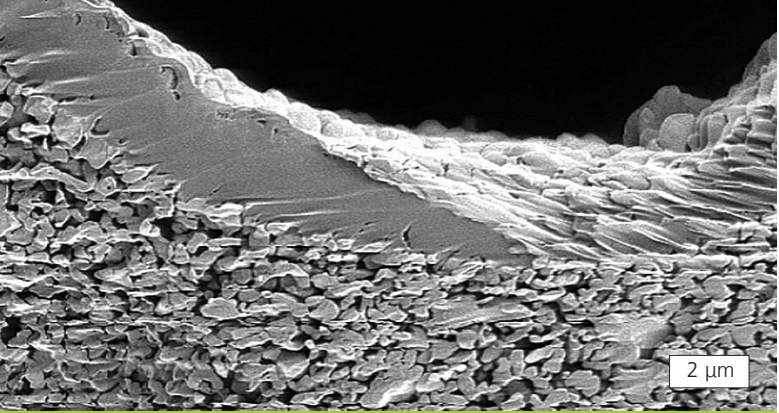
Energy technology

Catalysis

## Offer

Cooperation with industrial and research partners based on direct contracts or funded joint projects:

- Product evaluation and development
- Analysis of processes and production routes
- Raw material treatment and confectioning
- Tailoring of press bulk formulation
- Development of spray powder material and structure
- Development of graded functional beads
- Monitoring of market introduction of products
- Upscaling of developments at partner's site
- Development of characterization methods
- Partnership in joint projects
- Professional training



## Cooperation

Technische Universität Dresden, Institute of Materials Science  
Professorship Inorganic-Nonmetallic Materials, Group Compaction

- Characterization of compaction behavior of press bulk by instrumented compaction tools (10-600 MPa)
- Influence of formulation components on compactibility
- Influence of climate on compaction kinetics

Fraunhofer Institute for Manufacturing and Advanced Materials  
(IFAM-DD)

- Highly porous metallic materials based on melt-extracted metal fibres, on hollow spheres and on direct typed structures
- Development of metallic and intermetallic sintered and composite materials for structural and functional applications

Fraunhofer Institute for Material and Beam Technology (IWS)  
Dept. Thermal Coating, Group Thermal Spraying

- Research and development on different spray processes (APS, VPS, HVOF)
- Tailoring of materials composition to coating requirements and spraying technology
- Characterization of coatings (microstructure, porosity, phase composition, microhardness, corrosion, wear)

## Contact

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