Measurement devices and test plants

Particle formulation
- Extrusion, Twin Screw Extruder ZSE 18 MAXX, Leistritz
- Spheronization, 300 mm spheronizer
- Cold spraying setup for surface coating by fine particles
- Fluidised bed granulation, coating
- Fine milling systems
- Desublimation, coating of nanoparticles in gas

Particle size and concentration analysis solids, droplets
- In liquid: particle sizes from 1 nm up to 3 mm via particle counter, static and dynamic light scattering, flow potential and extinction methods
- In gas: particle sizes from 10 nm up to 3 mm via particle counter, aerodynamic particle sizer, scanning mobility particle sizer, static light scattering, electrometry, electrostatic separation, electrical low pressure impactor, 3-D light scattering

Porosity and surface analysis
- Helium pycnometer, Topas and Quantachrome
- BET, Quantachrome
- Zeta potential, Anton Paar

Particle deformation, adhesion, and breakage
- Nano-/Triboindenter, from 30 nN to 2 N, Hysitron
- Texture Analyser: granule test (max. 500 N) at control temperature and moisture
- Materials testing machine max. 10 kN, Zwick/Roell
- Measurement device for particle van der Waals forces
- High speed camera system for 3-D imaging of particle impact
- Air gun: impact and attrition of particles

Flow characteristics and conveying of bulk solids
- Translatory and ring shear testers with temperature control
- Bulk and tapped bulk density measurement devices
- Silos with force sensors
- Pneumatic transport system

Microscopy and high speed imaging
- Scanning electron microscope
- High speed cameras with microscopes

Filtration and separation technology
Aerosol technology
Distillation technology
UV/Vis spectrometry

We will be happy to cooperate with you. Please feel free to contact us.

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The Institute of Particle Process Engineering investigates different scientific subjects in almost all fields of particle technology. The research at the institute covers the main unit operations of the solids process engineering. These range from the formulation of particles with specific properties to the particle separation from the gas and liquid phase. The processes are studied experimentally and numerically on different time and length scales including particle-particle interaction, e.g. adhesion, deformation and breakage. Different processes with multi-phase flow are simulated by CFD, DEM and other methods.

We participate in:
Collaborative Research Center 926 „Microscale morphology of component surfaces“ founded by the German Research Foundation (DFG)
Priority Programme 2045 “Highly specific and multidimensional fractionation of fine particle systems with technical relevance“ (DFG)
Project Cluster ”Multiparametric characterization of particle-based functional materials using innovative online measurement systems“ (DFG-AIF)
Project Cluster ”Transport, storage and forming of industrially relevant granular materials“ (EU “Interreg“)

Particle Micromechanics
• Deformation and breakage of particles and agglomerates
• Particle-particle and particle-wall adhesion
• Friction and attrition of particles

Particle formulation and surface modification
• Desublimation and coating of fine particles in gas
• Extrusion and spheronisation of granules
• Investigation of agglomeration processes
• Particle formulation in fluidized beds
• Cold spray surface modification

Bulk solids handling
• Influence of temperature and humidity on bulk solids properties
• Flow behavior and compressibility of bulk solids
• Forces measurement in silos
• Transport processes during pneumatic conveying
• Mixing processes of solids

Gas phase separation processes
• Separation of aerosols
• Heterogeneous condensation on fine particles
• Characterisation of microstructures for aerosol separation
• Measurement of the particle size distribution in aerosols
• Aerosol deposition in electrical field

Liquid phase separation and membrane technology
• Particle classification in cross flow
• Design methods for depth filtration
• Design of magnetic separators
• Investigation of membrane processes
• Coating of barrier textiles by selective particle application

Sensor development
• Inline measurement of particle size and concentration by Dynamic Extinction Spectrometry
• Inline measurement of 3-D particle shape by 3D light scattering

Simulation and modelling
• Particles and bulk solids: Discrete Element Method, Contact Mechanics, Finite Element Method
• Fluid flow: Computational Fluid Dynamics
• Multi-phase flow: CFD-DEM coupling
• Porous microstructures: in-house code „DNSlab“