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Characteristics of powders and solid materials

We perform synthesis of nanostructured heterogeneous catalysts based on modern preparation approaches and characterization of solid powdered materials by using various instrumental techniques. R&D services and long lasting industrial cooperation is based on advanced research equipment, long-term experiences and competitive prices.

TGA — Thermogravimetric analysis



Measurements in thermogravimetric cell may be performed in inert, oxidative or reductive environments:

- thermal stability of materials
- pyrolysis and gasification simulation
- study of surface properties
  (static chemisorption, O_2 storage capacity, ...)
- various temperature programmed techniques

Product identification via coupled FTIR, micro-GC and MS techniques
Temperature interval from RT to 1000 °C

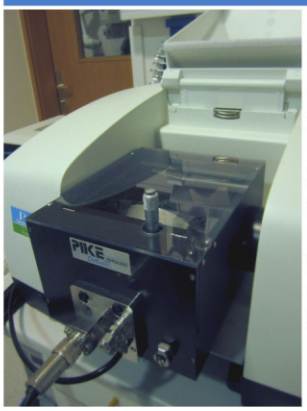
CHNS — Total carbon, hydrogen, nitrogen and sulphur



Determination of C, H, N in S contents in solid and liquid samples

Measurng range, expressed as weight % from 0 to 100 for all analytes

FTIR - DRIFTS — Infrared spectroscopy



Rapid material characterization with the use of ATR module

Preparation of KBr pelets for high-resolution measurements

High temperature DRIFTS cell for *in situ* monitoring of gas-solid reactions up to 900 °C

S_{BET}, ρ — Specific surface area, skeletal density



N_2 adsorption desorption measurements for determination of:

- BET specific surface area (m^2/g)
- total pore volume (cm^3/g)
- pore size distribution (meso, macro)
- average pore diameter (nm)

He pycnometry for determination of:

- skeletal density (g/cm^3)
- closed porosity (cm^3/g)

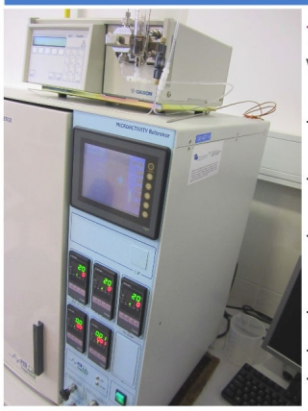
UV-vis DRS — Ultraviolet-visible spectroscopy



Characterization of materials by UV-vis spectroscopy:

- photocatalytic properties of materials
- light absorption capacity at various wavelengths
- determination of the forbidden band gap width
- monitoring of UV-active substances in solutions

MA-Ref — Multiphase catalytic reactor system



Temperature programmed processes with or without catalyst use.

- simultaneous introduction of up to six individual gases and one liquid stream
- operation at temperatures from RT to 950 °C and pressures up to 100 bar
- coupled to GC and HPLC for gas- and liquid-phase product identification

Two or three phase operation:
- tubular fixed-bed reactor
- trickle-bed reactor

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In the Laboratory for Environmental Sciences and Engineering we conduct basic and applied research on national and international level in the field of environmental heterogeneous catalysis (wastewater treatment, energy production from biomass and waste solids).
We develop and design novel chemical processes and technologies or parts of technologies. We advise domestic and foreign industrial partners and end-users on solving environmental problems, develop sustainable processes for wastewater and waste management, as well as conduct environmental impact assessment and other projects in the field of environmental protection. We are engaged also in the development and validation of analytical procedures for various instrumental techniques.