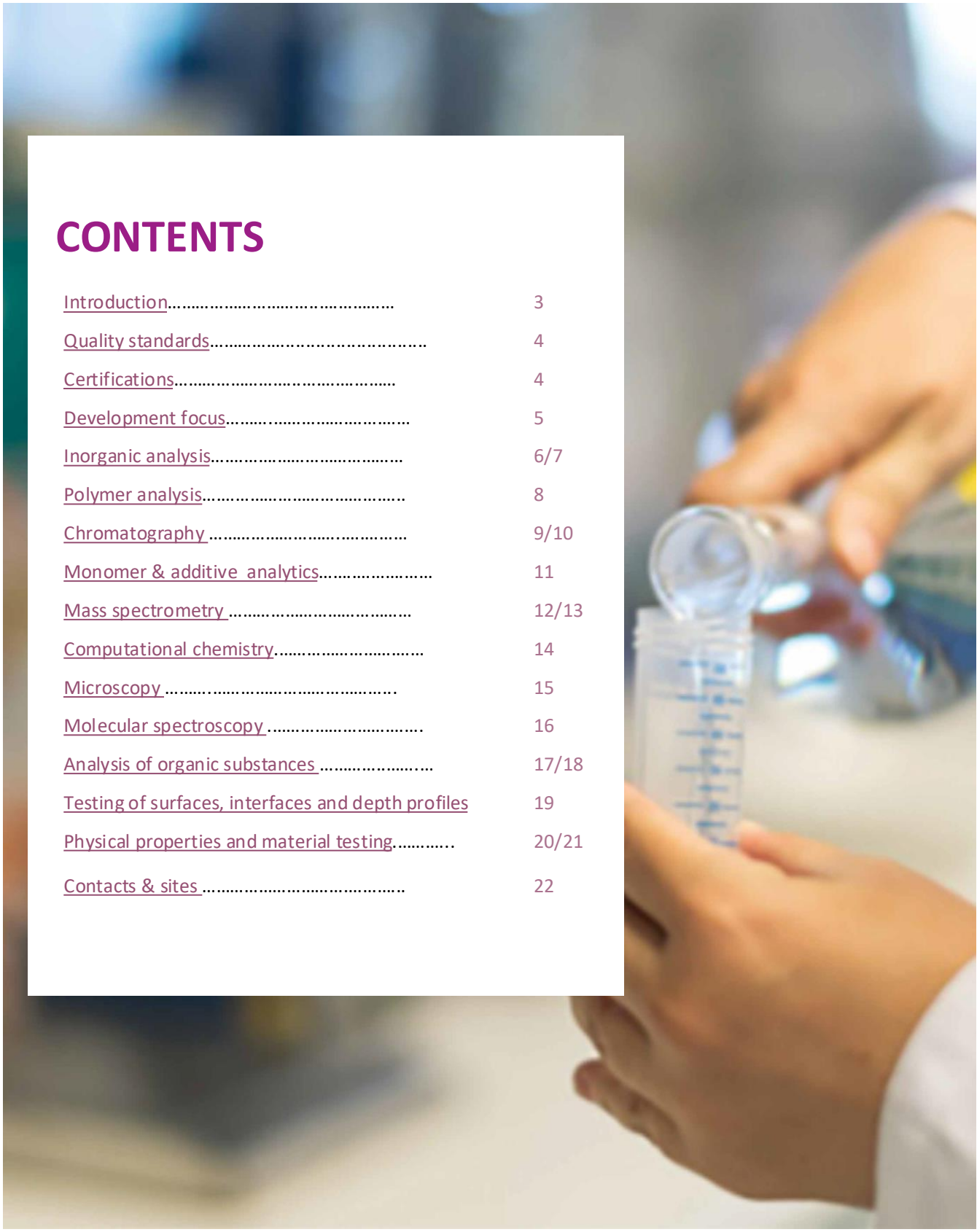
ANALYTICAL SOLUTIONS

FROM ONE SOURCE

Analytics by Evonik

EVONIK
Leading Beyond Chemistry

CONTENTS



INTRODUCTION

WHAT DO YOU EXPECT FROM A PARTNER OF ANALYTICAL SERVICES?

For instance, is there a contact person available to handle your questions personally? Analytical experts with the ability to understand your needs and to find the optimum solution for your requests?

We provide analytical solutions with the reliability and necessity of various quality standards, such as ISO 17025 or GMP.

With our techniques and methods, we have been serving our partners successfully for years in the field of specialty chemicals, pharmaceutics and polymers.

The tests, results and interpretations are naturally treated as highly confidential.

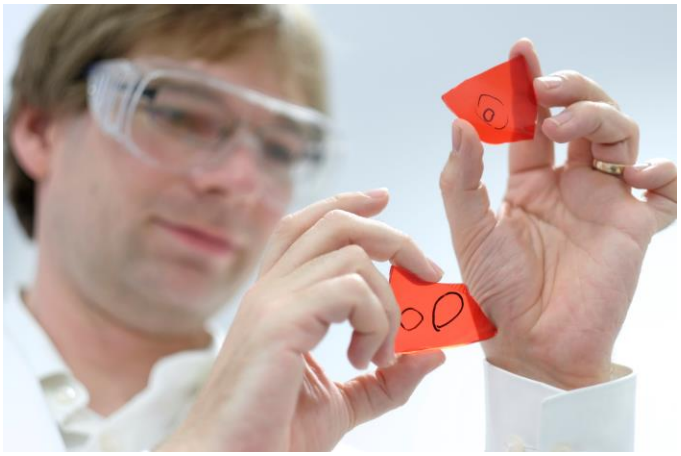
In our laboratories, we offer you analytical services in the field of research, process development, product development, application technology, upscaling and production.

The base is a broad range of modern qualified methods as well as a wide variety of internally developed techniques and procedures.

We draw on decades of experience and highly specialized know-how – let us be your competent partner in analytical questions!

Can you find the needle in a haystack?

QUALITY STANDARDS



EXPERIENCE

For you as our customer, it is truer than ever that time for solutions and projects is getting tighter all the time. So, it is a relief to have a reliable and experienced partner at your side who knows your business and can really help.

QUALITY

We guarantee the highest level of quality in all test methods. Our quality standards are recognized by various international and independent entities.

Regular participation in proficiency testing is a matter of course for us, as is regular monitoring and validation of our processes.

CONFIDENTIALITY

The samples, analytical methods and the corresponding results are naturally treated as confidential. Upon request, additional confidentiality agreements can be arranged.

PROCESSING TIME

We guarantee the fastest possible on-time processing of your order in accordance with your requirements. Because of various accessible techniques, it may even be possible within one day.

OUR CERTIFICATIONS AND ACCREDITATIONS

- Accreditation according to DIN EN ISO/IEC 17025 (DAkkS)
- Certification according to DIN EN ISO 9001
- Work according to § 67 German Drug Law (AMG) / cGMP, FDA-registered)
- Environmental management system as per DIN EN ISO 14001
- Handling permittance following the German Narcotics Law (BtMG)

DEVELOPMENT FOCUS

GOALS

One of our core competences is to develop, assess and implement new analytical methods.

It is our goal to provide innovative and required methods at an early stage. We focus on a higher selectivity and sensitivity, rapidness, and even new kinds of information.

Furthermore, we support the establishment of company laboratories, method transfers and trainings.

Our focus is explicitly on specialized analytical services with a selected portfolio.

EXAMPLES

- CryoProbe Technology in NMR spectroscopy to increase sensitivity and reduce sample volumes
- Modern electron microscopic methods e.g. 3D-TEM
- High-resolution mass spectroscopy for structural elucidations, quantification of low concentrated impurities e.g. nitroso amines and bioanalysis
- X-ray micro-computerized tomography (µ-CT) for non-destructive analysis of three-dimensional specimen

INORGANIC ANALYSIS

IDENTIFICATION AND QUANTITATIVE ELEMENTAL TRACE AND BULK ANALYSIS

- AAS: atomic absorption spectroscopy, by means of flame, graphite furnace, hydrides and cold vapor
- ICP-OES: optical emission spectroscopy with inductively coupled plasma for elemental determination of bulk content and trace analysis, high dynamic range, very robust
- ICP-MS: mass spectrometry with inductively coupled plasma, high resolution for ultra trace analysis, quantitative single element and multielement screening analysis
- GD-MS: Multielement trace and ultra-trace solid-state analysis, element overview
- XRF: X-ray fluorescence analysis, quantitative and qualitative single and multi element analysis, qualitative and semiquanti-tative overview XRF analysis with fundamental parameter analysis
- Volumetry, gravimetry
- Incineration and ash analysis, loss on ignition and loss on drying
- Color number determination
- Titrations (complexometric, acid/base, potentiometric, redox, argentometric, Karl Fischer)
- Ion-sensitive electrodes
- Ion chromatography, quantitative determination of halogenides, anions and cations
- Combustion analysis (Wickbold combustion, pyrohydrolysis)
- Combustion analysis and carrier gas hot extraction: elemental analysis of inorganic and organic samples, determination of C, H, N, S, and O
- Polarimetry (determination of optical rotation)

INFO

By using techniques suitable for solids and liquids, we are able to determine major and minor elements in inorganic and organic samples up to the trace and ultra-trace range.

The use of the optimal technology both from the point of view of feasibility and from the economic point of view is the basis here. The elaboration and selection of the appropriate sample preparation is the foundation for correct analytical results.

ELEMENTS ON SURFACES AND IN THIN LAYERS

- GD-MS: Glow discharge mass spectrometry
- Surface analysis, light and electron microscopy, energy dispersive X-ray spectroscopy (EDX)
- XPS: X-ray photoelectron spectroscopy for determination of elements and their binding states on the material surfaces on an atomic layer basis

FIELDS OF APPLICATION

- GMP – ICH Q3D
- Purity of substances for battery materials and electronic materials
- Crystalline forms of active pharmaceutical ingredients
- Content analysis, e.g. precious metal content in solid state catalysts
- Identification, composition and impurity analysis for REACH applications

CRYSTALLOGRAPHIC PHASE ANALYSIS

- XRD: Qualitative and quantitative phase analysis, including Rietveld refinement
- Quantitative determination of amorphous fractions/determination of crystallinity
- Crystallite size determination and determination of lattice parameters
- Small-angle scattering (SAXS) for determination of particle size distribution
- Temperature-independent (non-ambient) structure characterization
- Polymorphy

POLYMER ANALYSIS

ANALYSIS OF POLYMERS

- Deformulation of polymer materials
- Mechanical/physical and chemical separation methods
- Extraction techniques (microwave extraction, Soxhlet, etc.)
- Identification of components (e.g. additives, emulsifiers)
- Separation and identification of material inclusions, impurities, and surface coatings or deposits

DISC CENTRIFUGE

- Particle size distribution in aqueous dispersions from 10 nm to approx. 10 µm
- Identification of particulate impurities in dispersions

POLYMER CHARACTERIZATION

- Determination of the chemical heterogeneity via gradient HPLC
- Various types of 2D chromatography
- Micro preparative isolation of unknown components
- Determination of conversion and polymer content

NEWSLETTER via QR-Code

INFO

To characterize polymers, several complicated methods usually must be used and combined. The polymers are broken down into their individual components, additives or auxiliary materials are isolated and the chemical composition is determined. The added value in terms of information usually comes from the de-formulation of the sample and subsequent analysis of the individual components.

THERMOGRAVIMETRY

- Thermostability, decomposition, and degradation of polymers
- Identification of decomposition products
- Content of carbon black
- Volatilization loss as per ASTM D6375

DIFFERENTIAL CALORIMETRY

- Determination of the glass temperature
- Melting and crystallization temperatures
- Thermal capacity

GPC

- Determination of polymer content
- Polymer concentration by RI, UV, and viscosity
- Eluent systems: THF, THF with addition of base and acid, DMAC with addition of base and acid
- Calibration via PMMA, PS and polybutadiene, PPG and Pullulan standards
- Solvent-enhanced GPC
- Preparative isolation of molar mass fractions
- Determination of polymer content

CHROMATOGRAPHY

GAS CHROMATOGRAPHY (GC)

- Detectors: Flame ionization, heat conductivity, mass spectrometry
- Special injection techniques: Split/split less, on-column, headspace, thermodesorption, pyrolysis
- Gas sampling
- GC after derivatization
- Headspace analysis (headspace GC, head-space trap GC/MS)
- High-temperature GC
- Pyrolysis GC/MS, multistage possible

HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC)

- Various separation selectivities, such as reversed phase, normal phase, ion exclusion and ion pair chromatography, etc.
- Various Detectors such as UV, diode array, fluorescence, refraction index, mass spectrometry, conductivity, light scattering (ELSD), charged aerosol (CAD), etc.
- Pre-column and post-column derivatization
- Separation of enantiomers, analytical racemate separation, determination of enantiomeric purity
- Micro preparative and preparative isolation of unknown components from products or product mixtures (identification, isolation of reference materials, recovery of pure product)

GEL PERMEATION CHROMATOGRAPHY (GPC)

- GPC with RI and UV detection in different organic solvents (e.g. THF, THF with modifier, toluene, toluene with modifier), water and water with different salt/modifier additions

ION CHROMATOGRAPHY (IC)

- Determination of inorganic and/or organic anions and cations
- In addition to the usual HPLC detection types, the main methods used are conductivity detection (with and without suppression technique) and electro-chemical detection

AMINO ACID ANALYSIS (AAA)

- Qualitative and quantitative amino acid determination, trace determination, amino acid analysis following hydrolysis (e.g. for peptide quantification and characterization)

INFO

Various chromatographic separation techniques are available to determine the purity, to quantify secondary components and determine organic trace components.
Different application options support our experts to optimize the methods for reliable results.
Finally preparative liquid chromatography enables us to isolate target impurities for your reference characterization and quantification of the impurity in your method.

THIN-LAYER CHROMATOGRAPHY (TLC)

Qualitative determination of main and secondary components

FIELDS OF APPLICATION

- Quantification of residual monomers and solvents
- Quantification of additives and stabilizers
- Assay and impurities according to EP and USP
- Determination as per EP “Ninhydrin-positive substances and ammonia”
- Carbohydrate analysis
- Compressed gas analytics (identity, composition, oil traces, particle content)
- Molecular weight distribution of polymers

CAPILLARY ELECTROPHORESIS (CE)

- Direct and indirect detection by UV, diode array
- Capillary zone electrophoresis (CZE) and micellar electrokinetic chromatography (MEKC)

BIOANALYTICS

- Gel electrophoresis (e.g. SDS-PAGE, Western Blotting)
- Assays with photometric detection (e.g. ELISA, kinetic analysis, end point analysis)

MONOMER & ADDITIVE ANALYTICS

INFO

We focus on production topics e.g. methacrylate chemistry to provide tailor-made solutions for fast analysis to meet the production needs of short response times.

GAS CHROMATOGRAPHY

- GC overview analyses
- Purity assays and C-number distribution
- Quantification of residual monomers and solvents, polymerization excipients and contaminants

LIQUID CHROMATOGRAPHY

- Determination and identification of stabilizers
- Determination of residual monomers and characterization of low molecular components in polymer compounds

ATOMIC SPECTROSCOPY

- Detection of various elements in the ppm range via ICP-OES and AAS (flame, graphite furnace)
- Pressure-less acidulation /acidic digestion

WET CHEMISTRY

- Titrations
- Water content according to Karl Fischer
- UV/VIS spectrophotometry
- Dry matter
- Viscosity
- Density
- Various standard tests (pH value, refraction index, turbidity etc.)

MASS SPECTROMETRY

ORGANIC MASS SPECTROMETRY

- Ionization techniques: Electron impact (EI), chemical ionization (CI), electrospray ionization (ESI), nano-ESI, atmospheric pressure chemical ionization (APCI), matrix assisted laser desorption/ ionization (MALDI)
- Positive and negative ions
- Quantification with triple stage quadrupole mass spectrometry
- Qualitative measurements for structural determination with high-resolution mass spectrometry
- High resolution and maximum resolution with Orbitrap mass spectrometry
- Multidimensional mass spectrometry (MS-MS, MS^n)
- Accurate masses for determination of the element composition/empirical formula
- Matrix Assisted Laser Desorption Ionisation - Time Of Flight (MALDI-TOF)

INFO

Mass spectrometry allows the identification and quantification of single components in complex mixtures of substances.
The high sensitivity of this method enables to detect substances even at trace levels.

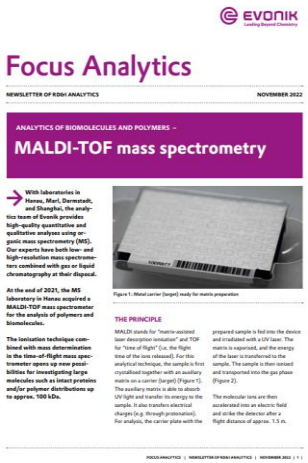
COUPLING TECHNIQUES

- Direct vaporization
- Coupling with gas chromatography (GC)
- Static/dynamic headspace GC/MS (HS-GC/MS)
- Thermodesorption GC/MS (TD-GC/MS)
- Pyrolysis GC/MS
- Liquid chromatography (HPLC, micro-HPLC, nano-HPLC, UPLC)
- Coupling of liquid or gas chromatography with MS for determination of accurate masses

SPECIAL TECHNIQUES

- High-throughput quantification using single reaction monitoring (SRM) techniques
- LC/MS in chiral phases

NEWSLETTER via QR-Code


EVONIK

Focus Analytics

NEWSLETTER OF RDGI ANALYTICS NOVEMBER 2022

ANALYTICS OF BIOMOLECULES AND POLYMERS –

MALDI-TOF mass spectrometry

With laboratories in Hanau, Marl, Darmstadt, and Shanghai, the analytics team of Evonik provides high-quality quantitative and qualitative analyses using organic mass spectrometry (MS). Our experts have both low- and high-resolution mass spectrometers combined with gas or liquid chromatography at their disposal.

At the end of 2021, the MS laboratory in Hanau acquired a MALDI-TOF mass spectrometer for the analysis of polymers and biomolecules.

The ionization technique combined with mass determination in the time-of-flight mass spectrometer opens up new possibilities for investigating large molecules such as intact proteins and/or polymer distributions up to approx. 100 kDa.

Figure 1: Metal carrier (target) ready for matrix preparation

THE PRINCIPLE

MALDI stands for "matrix-assisted laser desorption ionization" and TOF for "time of flight" (i.e. the flight time of the ions released). For this analytical technique, the sample is first crystallized together with an auxiliary matrix on a carrier (target) (Figure 1). The auxiliary matrix is able to absorb UV light and transfer its energy to the sample. It also transfers electrical charges (e.g. through protonation). For analysis, the carrier plate with the prepared sample is fed into the device and irradiated with a UV laser. The matrix is vaporized, and the energy of the laser is transferred to the sample. The sample is then ionized and transported into the gas phase (Figure 2).

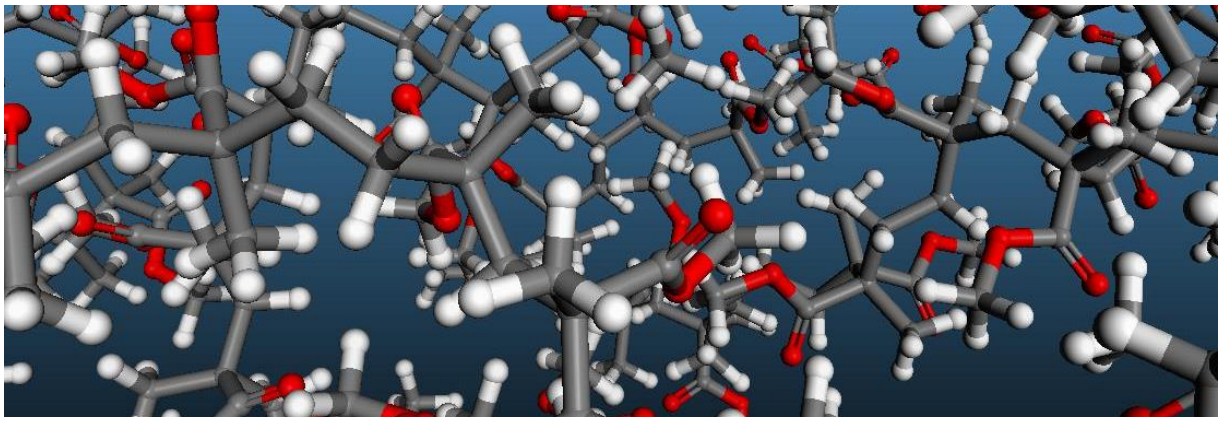
The molecular ions are then accelerated into an electric field and strike the detector after a flight distance of approx. 1.5 m.

FOCUS ANALYTICS | NEWSLETTER OF RDGI ANALYTICS | NOVEMBER 2022 | 1 |

FIELDS OF APPLICATION

- Structural characterization of molecules
- Assignment of structures to peaks in chromatographic profiles
- Identification / elucidation of impurities
- Quantitation of low abundant impurities
- Ultra trace analysis for toxic impurities (e.g. specific nitrosamines)
- Analysis of technical polymers (molecular weight distribution)
- Identity and purity testing of proteins
- Enzymatic protein digestion and peptide mapping
- Sequence analyses of polypeptides/proteins using MS/MS techniques
- Qualitative and quantitative proteomics

COMPUTATIONAL CHEMISTRY



MOLECULAR SIMULATIONS BASED ON QUANTUM-CHEMICAL, FORCE FIELD AND STATISTICAL METHODS

- Chemical reaction mechanisms
- Activation energies and reaction energies
- Molecular interactions
- Catalysis and surface chemistry
- Prediction of molecular spectra
- Prediction of material properties
- Phase equilibria and solubilities
- Structure-property relationships

INFO

Computational Chemistry provides insight into chemical systems at the atomic level. Structures and properties can be predicted prior to planning experiments.

Furthermore, simulations can be performed complementary to experiments to better understand experimental findings.

MICROSCOPY

ELECTRON MICROSCOPY

- Scanning electron microscopy (SEM) and field emission scanning electron microscopy (FE-SEM) with, secondary electron detector, material contrast backscatter detector
- Sample preparation techniques: e.g. (cryo-) microtomy, embedding, grinding, polishing, cryo-fracture, selective etching, low-vacuum unit for sensitive samples and “gentle beam” with in lens-detector (both possible without sample sputter/carbon coating)
- Transmission electron microscopy (TEM) with resolution down to 1.4 angstroms
- 3D Imaging in TEM via TEMography
- Sample preparation techniques: e.g. (cryo-) ultramicrotomy, contrasting methods
- Electron diffraction, determination of lattice constants
- X-ray micro-analysis (EDS) on SEM and TEM, integral analyses (point, area), line spectra (line scan), element distribution images (mapping, quantitative mapping)
- Particle size distributions
- Primary particle size determination (as per ASTM, by means of particle sizing technique)
- Aggregate size distributions and classification analyses (form factors, branching, etc.)
- Plasma preparation techniques, incl. surface cleaning/etching and cross section polishing
- Digital image processing, evaluation (statistics) and documentation

LIGHT MICROSCOPY

- Light microscopy (reflected/transmitted light, polarization, fluorescence) DIC (differential interference contrast)
- Contrasting of organic matter (regular and fluorescent dyes)
- Digital image processing, evaluation (statistics) and documentation

X-RAY MICRO COMPUTED TOMOGRAPHY

- 2D and 3D-datasets of material with low to medium density (organic matter, polymers, ceramics, thin metal layers)
- Evaluation of virtual planes in any possible direction of a 3D-reconstruction
- Evaluation of volume-based parameters (defects/inclusions, distribution/orien-tation of filler materials, phase boundaries, etc.)
- Statistics and non-destructive inspection as a basis for target preparation

MOLECULAR SPECTROSCOPY

NMR SPECTROSCOPY

- 400-, 500- and 600-MHz NMR spectrometers, i.e., with CryoProbe Technology (500 and 600 MHz) for maximum sensitivity at ^{1}H and hetero nuclei
- ^{1}H-, ^{13}C-, ^{29}Si- and ^{31}P-NMR spectroscopy in routine operations
- NMR-active hetero nuclei possible (^{11}B, ^{15}N, ^{27}Al, ^{119}Sn, ^{195}Pt, etc.)
- Special pulse techniques, multidimensional NMR for structural determination
- Kinetic measurements, molecular dynamics
- Solid-state NMR (400 MHz), MAS/CP-MAS

FIELDS OF APPLICATION

- Determination of identity and molecular structure by NMR
- Content determinations via certified internal standards (qNMR)
- Unknown Particle identification by IR-/ Raman-Microscopy
- Assay determination by UV/Vis

INFO

Due to the spectroscopic properties of their consisting atoms, molecules can easily be characterized via NMR spectroscopy, just like an identification by fingerprints.

We can determine the purity of a substance and identify impurities or by-products as well as monitor the turnover of chemical reactions.

SPECTROSCOPY IN THE ULTRAVIOLET AND VISIBLE RANGE (UV/VIS)

- UV/VIS spectrometer

INFRARED/NEAR-INFRARED/FAR-INFRARED SPECTROSCOPY (IR/FIR), RAMAN SPECTROSCOPY

- Fourier transform infrared spectroscopy (FT-IR)
- Surface and (micro)particle analysis with attenuated total reflection (ATR, diamond ATR, germanium ATR)
- Identity check using spectroscopy
- Infrared (IR) and Raman microspectroscopy and particle analysis
- Confocal Raman spectroscopy (excitation with different laser wavelengths, surface mapping)
- Diffuse transmission and reflexion

ANALYSIS OF ORGANIC SUBSTANCES

CHEMICAL PARAMETERS

- Pharmacopoeia tests (e.g. USP, Ph. Eur., DAB, among others)
- Bromine, iodine, carbonyl, ester, hydroxyl, acid, base, saponification numbers
- Water determinations (in solid, liquid, and gaseous samples)
- Evaporation residue, residual moisture, dry, and extract contents
- Ash, volatility
- Color numbers, colorimetry, photometry (APHA, Gardner, Sayboldt, iodine, among others)
- Angle of rotation (polarimeter, (heat able) microcuvettes)

ELECTROCHEMICAL METHODS

- Conductometry, coulometry
- Potentiometry (mass analyses)
- Voltammetry

FIELDS OF APPLICATION

- Analysis of active pharmaceutical ingredients (APIs) and drug substances according to pharmacopeia tests under GMP
- Assay determination by UV/VIS spectroscopy
- Reference characterization by elemental determination (C, H, N, S and O)

PHOTOMETRY, UV/VIS SPECTROSCOPY

- Anions, cations, stabilizers, aldehydes, phenols
- Spectroscopic determination of color numbers (APHA, Gardner, yellowness index, etc.)
- UV/VIS applications with/without derivatization, color reactions, and derivative spectroscopy
- UV/VIS spectrometer (registering and diode array), transmission and reflection measurements

WET ANALYSES, TITRATIONS

- Neutralization, precipitation, redox titration, complexometry, potentiometry
- Titration in nonaqueous media
- Two-phase titrations for surfactants
- Water determination as per Karl-Fischer (coulometric, volumetric, and by means of the KF oven)

COMBUSTION ANALYSIS, ELEMENTAL ANALYSIS

- C/H/N/S/O determination
- Oxygen content determination in high-temperature oven, even in metal/metalloid oxides and in samples containing fluorine or phosphorous
- Total content of sulphur, chlorine, bromine, iodine after Wickbold or Schöninger digestion
- Content of inorganic carbon (TIC)
- Content of organic carbon (TOC, DOC)
- Total of carbon (TC)
- Total of nitrogen and nitrogen in ammonium as per Kjeldahl
- Nitrogen determination by chemiluminescence detection

INFO

Organic-analytical techniques enable to get the total of elements and functional groups of compounds. In combination with highly selective analytical methods (separation methods, spectroscopy), the composition of the sample can be fundamentally investigated and analytically split up to its smallest units.

TESTING OF SURFACES, INTERFACES AND DEPTH PROFILES

SOLID STATE SURFACE ANALYSES

- X-ray photoelectron spectroscopy (XPS) / electron spectroscopy for chemical analysis (ESCA), monochromatized X-radiation for determination of elements and their binding states on the material surfaces on an atomic layer basis
- Small spot XPS
- Ultraviolet photoelectron spectroscopy (UPS)

FIELDS OF APPLICATION

- Surface/porosity of Synthetic Amorphous Silica (SAS) -powders, foams, Pharmaceutical particles for technical developments or REACH registration
- Calorimetric characterization of any product up to over 1200°C - phase change, decom-position, etc.
- Density of specific products and determi-nation of VSSA (Volume Specific Surface Area) at solid SAS, Catalysts, Nanobeads
- Thermal effects and material loss through evaporation or decomposition at foils, membranes, foams or powders
- Change of organic (polymer) or modified inorganic (e.g. modified SAS) matter through analysis of volatile reaction products at specific temperatures
- DLS on e.g. SAS-dispersions or -powders (after preparation) to obtain particle size distributions
- Effects of different additives on physical behavior (melting, crystallization, wettability)
- Combination of suitable methods to get a total, complementary overview

SORPTION ANALYSIS AND POROSIMETRY

- Specific surface (BET)
- Determination of pore sizes via gas adsorption (micropores and mesopores)
- Hg-porosimetry (macropores)
- Determination of the dispersion of metals (Pt, Pd, Rh, Ni, Cu, …) on substrates via chemisorption methods
- Dynamic vapor sorption (DVS)

TENSIOMETRY AND CONTACT ANGLE

- Surface and interface tension measurements on liquids (ring, plate, pendant drop, spinning drop method)
- Critical micelle formation concentration (CMC)
- Contact angle (sessile drop)
- Wetting and wetting angle on level surfaces, fibers and powders

PHYSICAL PROPERTIES & MATERIAL TESTING

INFO

Physical investigation tests provide essential information for the characteri-zation of substances and materials. It is essential to know the physical properties of a material e.g. to develop products with high-quality application properties or to design, optimize, and control production processes.

PHYSICAL AND OTHER PARAMETERS

- Density measurements via pycnometers (solids), oscillating U-tube (liquids) and spindels
- Determination of apparent density of porous and rigid polymer samples
- Determination of the bulk density and tapped density
- Powder flow behavior (angle of repose, flow index, Hausner ratio)
- Melting point (capillary method, DSC)
- Boiling point (DSC)
- Sieve analysis
- Vapor pressure (static, dynamic)
- Surface tension
- Refractive index
- Specific heat measurements
- Calorific value, heating value
- Dynamic vapor sorption (DVS)
- Conductivity of aqueous solutions
- Flash point
- Cloud point and pour point

PARTICLE SIZE DISTRIBUTION

- Laser diffraction analysis (wet and dry dispersion method)
- Optical single particle counter
- Sieve analysis (dry sieving)
- Dynamic light scattering (DLS)

THERMAL ANALYSES AND CALORIMETRY

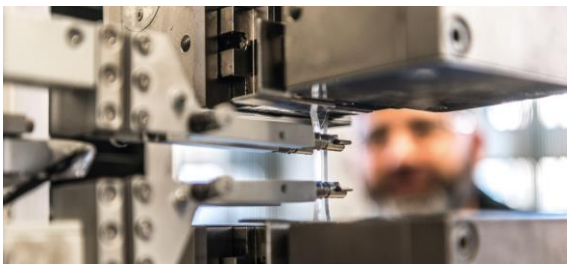
- Thermogravimetry (TG, thermal stability)
- Differential scanning calorimetry (DSC)
- Simultaneous thermoanalysis (TG / DSC))
- Evolved gas analysis (EGA) TG with IR-spectroscopy and mass spectrometry

MECHANICAL TESTS on

- Tensile strength
- Compression
- Bending/flexural test
- Peel tests
- Shear tests
- Relaxation tests
- Impact or notched impact strength as per Charpy and Izod
- Tensile impact tests
- All the methods above are also available at various temperatures
- Ball indentation hardness
- Shore hardness

PREPARATION OF SPECIMENS by

- Sawing
- CNC milling
- Polishing
- Drilling
- Grinding
- Constructions made of PLEXIGLAS®, plastics in general or aluminum



RHEOLOGY, VISCOMETRY AND THERMAL TESTING

- Melt mass flow rate MFR/MVR
- Flow/ viscosity curves
- Dynamic mechanical thermoanalysis and torsional vibrations (DMTA)
- Rotational and oscillating methods (flow curves, flow limit, viscoelastic behavior, structure determination)
- Capillary viscometry
- Viscosimetry according to Höppler
- Minimum film forming temperature (MFFT)

FIELDS OF APPLICATION

- Preparation of test specimens according to international standards
- support for determination of extrusion and injection molding parameters (MFR / MVR)
- Testing of porous materials, PLEXIGLAS semi-finished products for e.g. aviation applications and medical devices made of high-performance polymers, as well as biodegradable materials
- Testing of raw materials for e.g. interieur and exterior molding compounds in automotive applications
- Testing of adhesive materials in sandwich compounds and multi-layered films, as well as (food-) packaging
- thin films for construction Industry (e.g. window profiles)
- Characterization of impact modified polymers (DMTA, Charpy, Izod, Tensile Test)

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