NETZSCH

Proven Excellence.

Product Overview

Thermal Analysis, Thermophysical Properties Testing, Cure Monitoring, Rheology, Accelerating Rate and Isothermal Calorimetry, Fire Testing and HotBox Test Chambers

Analyzing & Testing

The Broadest Portfolio for
THERMAL

Differential Scanning Calorimetry (DSC)
Differential Thermal Analysis (DTA)

-180°C to 2000°C

The various types of NETZSCH DSC instruments all operate in accordance with the heat flow principle. They are characterized by a three-dimensional symmetrical design with homogeneous heating. Sensors with high calorimetric sensitivity, short time constants and a condensation-free sample chamber in the DSC cell ensure high detection sensitivity.

Thermogravimetric Analysis (TGA)

10°C to 1100°C

NETZSCH TGA instruments are equipped with digital balances and are vertically designed, featuring a top-loading sample arrangement and direct temperature measurement at the sample.

Simultaneous Thermal Analysis (STA)
TGA-DTA/TGA-DSC/TGA

-150°C to 2400°C

With the STA instrument series, NETZSCH is setting high standards. Unlimited configurations and unmatched performance are the foundations for a great variety of application possibilities in fields such as ceramics, metals, plastics and composites over a broad temperature range.

ANALYSIS

Dilatometry (DIL)/Thermomechanical Analysis (TMA)

-180°C to 2800°C/-150°C to 1550°C

Dimensional changes of the specimen as a function of temperature under a defined load can be monitored with the DIL 402 *Expedis* series of pushrod dilatometers. Interchangeable furnaces cover all applications for high-precision expansion control in development, basic research and quality control in a very wide temperature range.
The TMA 402 ***F1/ F3*** *Hyperion*® series is determining the dimensional changes in solids, liquids or pasty materials as a function of temperature and/or time under a defined mechanical force.

Dynamic Mechanical Analysis (DMA) up to High Forces

-170°C to 1500°C

The robustness of the DMA 242 *Artemis* and the high resolution of its deformation measuring system enable precise determination of the visco-elastic properties of both rigid and soft polymers and composites. For measurements up to very high load and temperatures up to 1500°C, the EPLEXOR® series is available. It allows for, e.g., the investigation of the rolling resistance of tires or fatigue testing of composites and adhesive joints.
Both DMA systems can be applied to elastomers, thermoplastics, metals, glasses, and ceramics to biomaterials and even foods. They can be equipped with a humidity generator, automatic sample changer system (EPLEXOR®), DEA sensor, etc.

Calorimetry (ARC/MMC)

RT to 500°C

The Multiple-Module Calorimeter MMC 274 *Nexus*® measures chemical reactions and phase changes on gram-size samples for the investigation of process safety, thermal runaway reactions (Heat-Wait-Search), coin cells, etc. Additionally, the well proven Accelerating Rate Calorimeters ARC 244/254 with the patented *VariPhi*® technology, are high-end systems investigating data relevant to processing and storage of chemicals, chemical process safety and the evaluation of thermal and pressure hazard.

Evolved Gas Analysis (EGA) Coupled to Thermal Analysis

By coupling a gas analyzer such as a quadrupole mass spectrometer (QMS 403 *Aëolos Quadro* or *SKIMMER*), GC-MS and/or FT-IR (Fourier Transform Infrared Spectrometer by BRUKER Optics) with a thermal analyzer, the detection of evolved gases and identification of the separated components can be precisely time-correlated with the thermal analysis signals.

Cure Monitoring by Dielectric Analysis (DEA)

-140°C to 400°C

For the investigation of thermosetting resins, composites, adhesives and paints, Dielectric Analysis has stood the test of time. An important value in describing curing processes is the ion conductivity. In order to address all possible needs, NETZSCH offers both single- and multiple-channel DEA systems.

Refractory Testing by RUL and HMOR

RT to 1700°C

Special strength-testing methods have been established for refractory ceramics. The RUL 421, Refractoriness under Load (RUL) and Creep in Compression (CIC), identifies the deformation resistance of a test piece under a defined load at a specified temperature/time program. The Hot Modulus of Rupture (HMOR 422) at high temperatures is determined as the amount of force applied to a rectangular test piece at high temperatures until failure occurs.

Laser/Light Flash Analysis (LFA)
Time Domain Thermoreflectance (TDTR) – LFA for Thin Films

-125°C to 2800°C

Thermal conductivity and diffusivity are the most important thermophysical material parameters for the description of the heat transport properties of a material or component. For precise measurement of the thermal diffusivity over a wide temperature range, the laser/light flash technique has become established as a fast, versatile and accurate absolute method. For sample thicknesses in the nanometer range (thin films), the Time Domain Thermoreflectance method is available.

Simultaneous Determination of Seebeck Coefficient and Electrical Conductivity

-125°C to 1100°C

One approach in the field of thermoelectricity is to generate electrical energy from released heat. The SBA 458 *Nemesis*® can accompany the development of thermoelectric materials with high working temperatures and optimized efficiency. It allows for the simultaneous measurement of the Seebeck coefficient and electrical conductivity under identical conditions.

Thermal Conductivity by Heat Flow Meter (HFM) and Guarded Hot Plate (GHP)

-160°C to 600°C

Our HFM 446 *Lambda* Eco-Line measures the thermal conductivity/thermal resistance and specific heat capacity of insulating materials in quality control. The GHP prinicple is based on an absolute measurement procedure (no calibration required). In research, the Guarded Hot Plate, GHP 456 *Titan*®, with innovative plate material and temperature sensors provides excellent reliability and accuracy over a wide temperature range. The unmatched software features a report generator, includes standard reports for QA and $\lambda_{90/90}$ calculation for CE declaration (HFM). Especially for thick and heavy specimens, the GHP 500/600/900 are available – also with customized hot plates and tiltable test chamber (GHP 900 S).

RHEOLOGY

Rheological properties can be tested for all materials from fluids such as dilute solutions of polymers and surfactants through to concentrated protein formulations, to semi-solids such as pastes and creams, to molten or solid polymers as well as asphalt binders.

Kinexus Series

Kinexus rotational rheometer platform has been developed from extensive market feedback. The integrated innovative instrument design includes a revolutionary software interface. In a broad temperature range between -40°C to 350°C, a wide torque range from 0.5 nNm to 240 nNm is available. The Kinexus series includes standard rheometers (Kinexus lab+, Kinexus pro+) and a rheometer for advanced testing (Kinexus ultra+) in research and development. Especially for the asphalt industry, the dynamic shear rheometer Kinexus DSR covers all what it takes for the asphalt and bitumen testing, e.g., Standard Operating Procedure (SOP) based testing with a built-in library of standard test protocols for asphalt binders.

Rosand Series – Bench top capillary rheometer for research to QC testing

Capillary rheometers are available as compact systems capable of meeting most test requirements encountered in capillary rheometry. Combining many advanced features associated with larger floor-standing models, the Rosand RH2000 system can be configured for research measurements through to Quality Control applications. The robust "H"-frame design of the floor standing Rosand RH7 and RH10 allows operation under ultra-high loading conditions, as well as providing optimized space for multiple accessory configurations. A special digital drive system gives the RH7 and RH10 unsurpassed performance in terms of speed control, accuracy, and dynamic operating range.

Advanced Software

Kinetics Neo and Kinetics as a Service

The kinetic analysis of thermal measurements allows finding the set of kinetic parameters, e.g., number of steps, contribution of each step to the total effect of the process such as step enthalpy or stepping mass loss; reaction type, activation energy and reaction order for each step. Then this information will be used for predictions of reaction progress for given temperature conditions or optimization of temperatures to get the desired reaction rate and product concentrations.

With Kinetics as a Service, NETZSCH offers a comprehensive package which supports the understanding and improving of your process without expensive trial and error.

Temperature Modulation

When applying temperature modulation, the linear heating rate is superimposed by a sinusoidal temperature change. This makes it possible to deconstruct the signals into reversing and non-reversing parts (DSC, DIL, TMA) and thereby separate overlapping effects – for example, glass transitions and relaxation peaks (DSC) or thermal expansions and sintering steps (DIL, TMA – and to calculate activation energy(ies) from a measurement (TGA).

AutoEvaluation

AutoEvaluation is a unique, self-acting evaluation routine that finds and evaluates all effects in DSC and TGA curves by means of an intelligent mathematical algorithm. Experienced users can utilize the automatic evaluation result as a second opinion or employ this exceptional function to achieve results faster.

Identify

Identify gives an identification and classification of materials via database comparison for material identification and Pass/Fail testing in quality control. The NETZSCH libraries contain more than 1100 entries related to different application areas such as polymers, organics, inorganics, metals/alloys or ceramics. The additionally available KIMW database includes DSC curves of 600 commercially available polymer types.

Products

Proteus® Protect

Proteus® Protect ensures data integrity at the highest level and meets the requirements of 21 CFR Part 11 or EU Annex 11.

Super-Res® (RCM, RCS)

This software feature offers rate-controlled temperature management (mass-change-controlled TGA, i.e., RCM; and shrinkage-rate-controlled dilatometry, i.e., RCS) is well suited for increasing the resolution of superimposed effects and enhancing sample compaction for sintering processes.

Purity Determination

For crystalline substances with known molar mass, *Purity* Determination serves to determine the percentage of eutectic impurities on the base of the Van't Hoff equation (evaluation of the DSC melting peak).

Peak Separation

If your experimental curve looks very complex with several overlapping peaks then our software helps separate these peaks, presents experimental data as a sum of peaks, and analyzes each peak separately. The universal peak shape is used, which is the weighted mixture of Fraser-Suzuki and asymmetric Cauchy. In addition, following peak types are included: Gaussian, Cauchy, Pseudo-Voigt (additive mixture of Gaussian and Cauchy), Fraser-Suzuki (asymmetric Gaussian), Laplace, asymmetric Laplace and asymmetric Cauchy.

Solutions Tailored to the Market

Hotbox Test Chambers

The HotBox Systems are constructively complex test devices for determining the heat transfer properties of wall elements, walls, windows and doors. In the HotBox, it is possible to simulate real-world conditions as they would exist for a building wall, by simulating conditions both inside the building and on the outside of the wall. The HotBox takes into consideration not only the heat conduction through the test specimen (pure material dependence), but also the heat transfer conditions (material properties and ambient conditions).
Our test chambers for determining the stationary heat transfer properties with a controlled Hotbox are in accordance with DIN EN ISO 8990, DIN EN 1946-4, DIN EN ISO 12567, DIN EN 12412-2, and ASTM C1363; and combined in accordance with DIN EN 1934

Fire Testing

The right choice of materials and components is crucial for fire protection and the spread of fires. Fire tests according to German, European and international standards for the classification of flammability and burning rate of materials for the construction, textile, automotive and electrical industries support product development. In compliance with product standards, NETZSCH tests flammability, the avoidance of rapid ignition and the generation of the lowest possible smoke development.

TCC 918 – Cone Calorimeter

UL 94 –
Fire Tester

TBB 913 – Floor
Radiant Panel

TNB 912 –
Non-Combustibility Tester

SBI 915 – Single
Burning Item

TDP T4 –
Fire Testing for Roofs

Product	KBT 916	SBI 915	TBB 913	TNB 912	KBK 917	TCC 918	UL 94	LOI 901	HBK 919	TRDA/ TRDL	TDP T4
Heat release	x	x				x					
Smoke development	x	x	x			x				x	
Flame spread	x	x	x								x
Flaming droplet	x	x					x				x
Non-combustibility				x							
Ignitability					x						x
Burning time/speed		x					x		x		x
Time to ignition						x					
Mass loss						x					
Heat of combustion						x					
Combustion gas						x					
Oxygen index								x			
O_2, CO_2, CO analyzer						x					
Euro classification/ Euro fire testing lab		x	x	x	x	x	x			Mostly integrated	x
Industry	Cables	Building	Building	Building	Building	Building, Auto-motive, Polymers	Electro-nics, Polymers	Polymers	Auto-motive	Single/ Stand-alone	Roofs
Standards	EN 50399, IEC 60332-3	EN 13823	EN ISO 9239-1	DIN EN ISO 1182	DIN EN ISO 11925-2	ISO 5660-1, ASTM E 1354	UL94, DIN EN 60695-11, ISO 9773	ISO 4589-2, DIN 22117, ASTM D 2863	ISO 3795, DIN 75200, MVSS 302, GB 8410, IS 15061, CMVSS 302, U.T.A.C. 18-502, FAR 25.853	DIN 50055	DIN CEN/TS 1187, test procedure 4

HBK 919 – Horizontal Burner Box

TRDA – Smoke Density Tester with light measurement system

KBK 917 – Small Burner Box

LOI 901 – Oxygen Index Analyzer

KBT 916 – Fire Testing for Cables

The NETZSCH Group is an owner-managed, international technology company with headquarters in Germany. The Business Units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems represent customized solutions at the highest level. More than 4,000 employees in 36 countries and a worldwide sales and service network ensure customer proximity and competent service.

Our performance standards are high. We promise our customers Proven Excellence – exceptional performance in everything we do, proven time and again since 1873.

When it comes to Thermal Analysis, Calorimetry (adiabatic & reaction), the determination of Thermophysical Properties, Rheology and Fire Testing, NETZSCH has it covered. Our 60 years of applications experience, broad state-of-the-art product line and comprehensive service offerings ensure that our solutions will not only meet your every requirement but also exceed your every expectation.

Proven Excellence.

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