ONset

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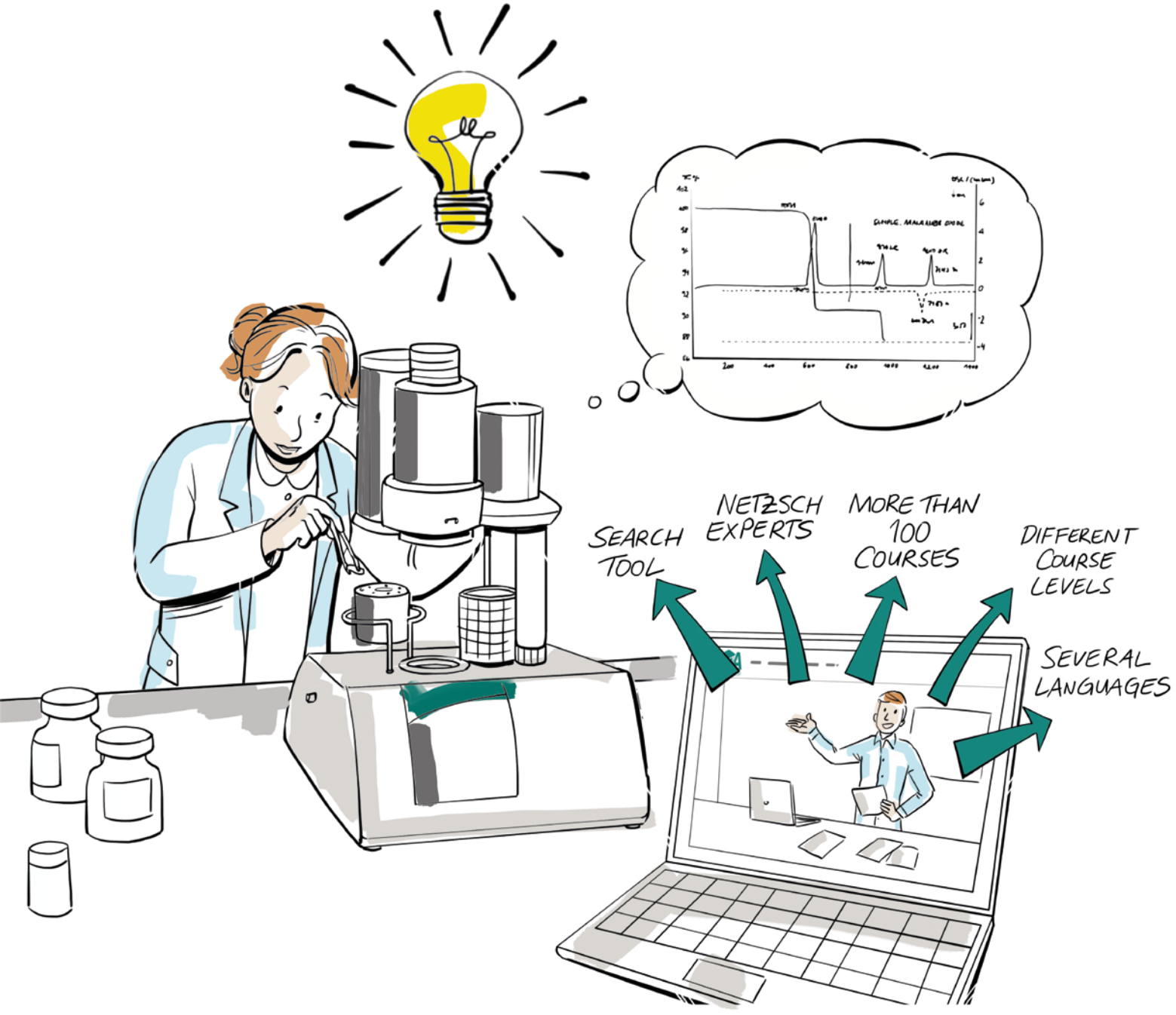

NETZSCH ONLINE ACADEMY

academy.netzsch.com

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60 YEARS ANNIVERSARY

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Editorial

Dear Reader:

I am very pleased that you are taking the time to read this issue of our customer magazine, **on**set. A wealth of information from various areas awaits you.

NOA is an acronym worth remembering. It stands for NETZSCH Online Academy – a recently launched project of ours. Through the NOA, you can familiarize yourself with topics in thermal analysis and rheology without having to leave your desk. More than 150 courses are already available in 10 languages, and the offerings are constantly being expanded: You can find out more on pages 4 and 5, or at academy.netzsch.com.

Energy supply will be one of Earth's major challenges in the years/decades to come. Read how thermal analysis can support the development of new material for energy conversion and storage in the 1st part of our series entitled "Next Generation Energy Materials".

"Tips & Tricks" is a new section on our website that helps facilitate your day-to-day work with NETZSCH instruments. Categorized by measuring method, you will find information on sample preparation, factors that influence measurements, and special measurement techniques or accessories.

Our *PRECISE PRACTICE* section this time deals with the question of how humidity affects the position of the glass transition temperature of amorphous substances. The temperature position can be decisive for the storability, applicability and processability of these materials.

We are also introducing some new products in this issue of **on**set: This time, it's the TDP T4, a fire testing instrument for roofs; the HFM 446 Eco-Line for determination of the thermal conductivity of insulating materials; and our new application book on capillary rheology, which will be published soon.

The NETZSCH DEA (DEA = dielectric analysis) has recently struck out on a new path with the recently founded NETZSCH Process Intelligence GmbH (NXP) under the brand name sensXPERT®. The measurement technique has made the leap out of the laboratory onto the shop floor and is now recommended for the control of manufacturing processes.

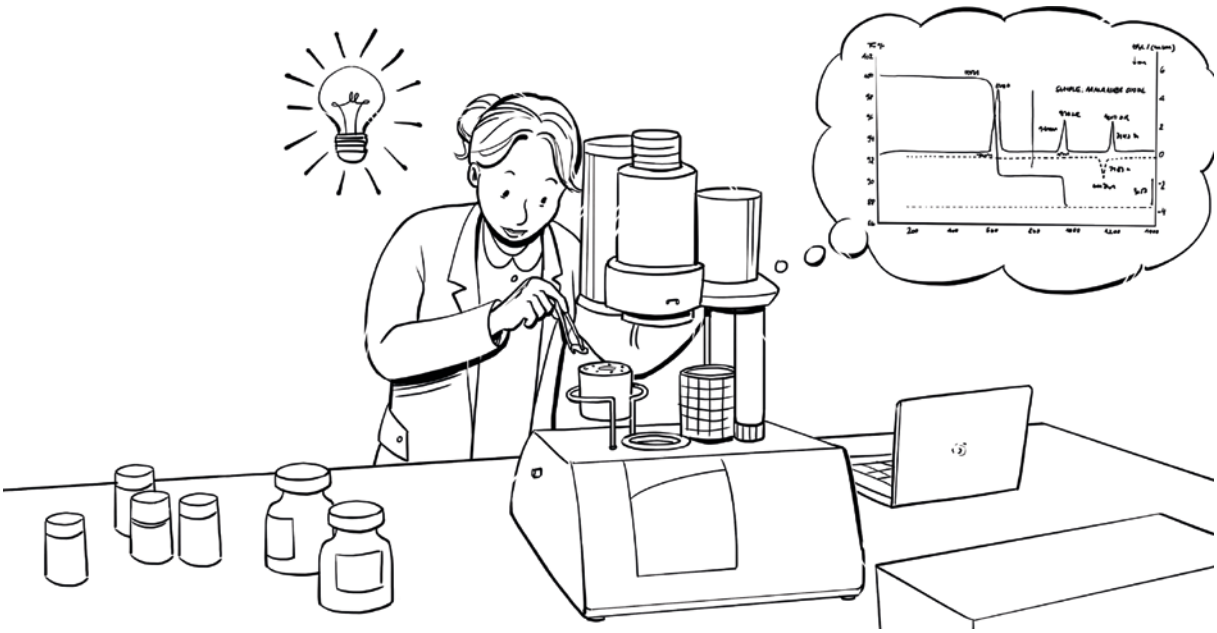
Last but not least, I would like to draw your attention to the fact that NETZSCH Gerätebau will be able to look back on 60 years of success in the field of thermal analysis. We would like to celebrate this anniversary together with you. Find out more on page 19.

I hope you enjoy your browse through this issue of **on**set!

Dr. Gabriele Kaiser
Business Field Management for Pharmacy, Cosmetics & Food

NETZSCH Goes Digital ...

Andrea Kesselboth, Knowledge Management, and Dr. Ekkehard Füglein, Training Department



Customer Training

Even before the COVID-19 pandemic started, NETZSCH-Gerätebau had begun to establish digital teaching and learning content for internal training courses. Due to global travel and contact restrictions and the trend towards mobile working, we have now also expanded these digital courses to the field of customer training. Along with the customary individual training courses at customers' sites or our training center in Selb, online training courses are now also offered. A steadily growing number of users now takes advantage of these, particularly for learning the basics of the measurement techniques, or how to define or optimize measurement programs, handle the software or evaluate the measured data.

In order to recreate the experience of group training courses in virtual form – as these were mostly held in the rooms at our training center in Selb in the form of seminars in the past – online group courses are now also offered. In these formats, content is clearly conveyed by alternately sharing screens as well as allowing external access to the training computer. By using prepared measurement examples, exercises can be carried out within the group of participants and experiences can be exchanged.

NETZSCH Online Academy NOA: Learn Directly from the Experts

In this context, we are pleased to introduce yet another form of training that goes hand in hand with digital transformation: Our NETZSCH Online Academy – NOA – offers the opportunity to learn more about thermal analysis and rheology topics without having to leave your desk. Take advantage of flexible online learning that you can tailor to your exact training needs. The objective of NOA is to pass on first-hand knowledge acquired by our experts.

No matter whether you are a beginner or an experienced user, you will quickly find an appropriate course using the filter function.

Customer Training & NOA

Currently, more than 150 courses in 10 languages are available in the catalog, and we are regularly expanding these offerings. The courses cover a wide range of applications related to thermal analysis and rheology: Choose between different applications such as polymers, ceramics & glass or pharmaceuticals. Or select specific training courses on rheometers, DSC or TGA. Courses typically include theoretical basics, influential factors, and information on how to start a measurement and how to evaluate a standard sample. For the online courses, you will receive a certificate of completion.

All you need for the NETZSCH Online Academy is a good Internet connection and your Internet browser:

https://academy.netzsch.com

On this homepage, you will get customer access to the Analyzing & Testing field. Our courses are thus available to you flexibly: worldwide and around the clock, whenever and wherever you are, without the need to travel. You can choose to learn during work, on a business trip or at home.

Design your learning the way you want! Your personal "learning status" section allows you to return to older courses at any time to repeat them or to continue courses you have not yet completed.

Come see for yourself by visiting our catalog at NETZSCH Online Academy.

If there are courses you particularly liked, please let us know your opinion. For each course, you can give up to a 5-star rating and write a comment. We welcome your assessment and will take your input into account as we continue to expand NOA. We always look forward to receiving requests and suggestions.

Take advantage of our new opportunities and become part of the NETZSCH family.

The benefits of NOA at a glance:

- More than 150 courses
- 10 different languages
- Majority of courses free of charge
- Learn directly from our experts
- Learn whenever and wherever you want
- Choose your course level (beginner, intermediate or advanced)
- Rate and comment your course

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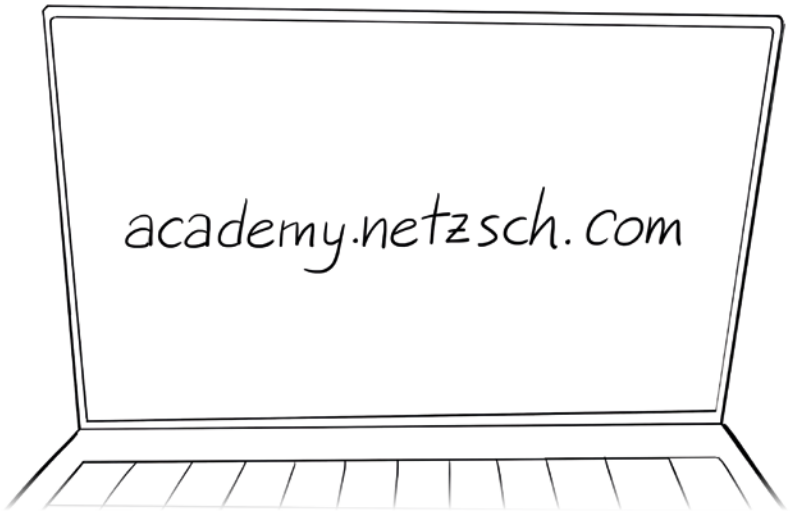

Next-Generation Energy Materials

Benchmarking Storage and Conversion Properties Using Thermal Analysis (Part 1)

Andrew Gillen, NETZSCH Australia Pty Ltd., and Dr. Michael Schöneich, Applications Laboratory

Fig. 1. A future reneweble energy production site

Introduction

According to recent United Nations population estimates, the world's population is expected to increase to 9.7 billion people by 2050 [1]. The inter-related problems of population growth, energy demand and climate change will undoubtedly bring many challenges in the years ahead.

In 2005, Nobel Laureate Richard Smalley ranked energy as the greatest problem facing society and proposed nanotechnology and other advances in materials science would make it possible to realize the vision of plentiful, low-cost energy supply [2].

Over the past 20 years, significant progress has been made in the development of new materials (solid and liquid) for energy conversion and storage applications. One example, graphene (discovered 2004), has received much attention because of its unique properties, including high thermal conductivity, high transparency and excellent mechanical properties [3,4].

Today, newly developed functional materials are being considered for applications including electrical energy storage (supercapacitors, superconductors), chemical energy storage (batteries, hydrogen fuel cells, solar fuels) and thermal energy storage (sensible, latent heat, thermochemical heat) [5,6].

The mentioned energy technologies all have different stages of technology maturity (TRL); hydrogen storage, for example, still needs considerable R&D effort before it will be economically viable for large-scale implementation. On the other hand, thermal energy storage already has over 3.2 GW of installed power capacity worldwide, 75% of which is deployed by molten salt storage technologies [7].

Many of the chemical energy storage systems under investigation require gas-solid reactions at defined temperatures. Meanwhile, thermal energy storage systems usually employ solid-solid, solid-liquid or liquid-gas reactions for energy storage and conversion. Key performance indicators including energy density, cycle efficiency, reaction kinetics and phase transformation enthalpies are used to determine suitability of candidate materials for the relevant technologies [8].

Thermal Analysis, especially Differential Scanning Calorimetery (DSC) and Thermogravimetry (TG or also called TGA, thermogravimetric analysis) are commonly used materials characterization methods for benchmarking energy materials. In the next sections we discuss the capabilities of the NETZSCH STA Eco-Line, which offers unrivalled flexibility and performance for the energy materials sector.

NETZSCH STA Eco-Line: Fascinating Flexibility for Energy Research Materials

Simultaneous Thermal Analysis (STA) generally refers to the simultaneous application of two or more thermoanalytical methods to one sample. The term most commonly refers to the simultaneous measurement of the mass changes and energetic effects on a single sample while being subjected to a controlled temperature program. The simultaneous measurement of TGA and

STA 449 Eco-Line

DSC is especially useful as exact enthalpy determination during a phase transition requires precise knowledge of the effective sample mass.

NETZSCH Analyzing & Testing have been manufacturing state-of-the-art STA devices for over 50 years. Our latest iteration, the STA 449 *Jupiter*® Eco-Line, combines a high-performance Heat-Flux DSC with a top-loading submicrogram-resolution thermobalance, offering an high sample load and measurement range. The Simultaneous Thermal Analyzer can easily be adjusted for different applications by selecting the optimum furnace*, installing the most appropriate sensor and using the proper accessories. Evolved gases from the sample during heating rise to the top chimney-style and can either be released at the furnace outlet or be directed into an optional mass spectrometer and/or FT-IR spectrometer.

Thermochemical energy storage processes often utilize reversible reactions for absorption/desorption under defined atmospheres and temperatures. The modular design of the STA 449 *Jupiter*® Eco-Line is ideally suited for carrying experiments under a wide range of test atmospheres. Precise gas mixing is made easy with up to 4 inbuilt mass flow controllers (MFCs). The gas mixture at the sample can be adjusted precisely by the measurement software at any time during a measurement.

The STA 449 *Jupiter*® Eco-Line operates under inert (N_2, He, Ar) and oxidizing (O_2, Air) atmospheres and also under vacuum. Measurements in CO_2 atmosphere are also possible up to 1200°C. The sample atmosphere can be dynamic or static, and with the appropriate sample carrier installed, measurements under reducing atmospheres (eg., forming gas) are possible to 1000°C and above.

Application Example: $CaMg(CO_3)_2$

Dolomite, $CaMg(CO_3)_2$, is considered to be a low-cost thermochemical energy storage material [9]. Figure 2 shows the decomposition of a 40-mg dolomite sample using an STA 449 ***F5*** *Jupiter*®. The sample was heated in a Pt crucible with lid at 10 K/min to 1200°C under CO_2 atmosphere. The plot shows two characteristic mass-loss steps; firstly, the calcination of magnesium carbonate (13.48%), followed by the calcination of calcium carbonate (32.17%). The DSC signal (blue) confirms both decomposition steps are endothermic. The use of CO_2 purge gas results in better separation of the decomposition steps compared with measurements under nitrogen or argon. This is explained by the Le Chatalier's principle, where the presence of CO_2 (a decomposition product) influences reaction onset temperatures and reaction rates.

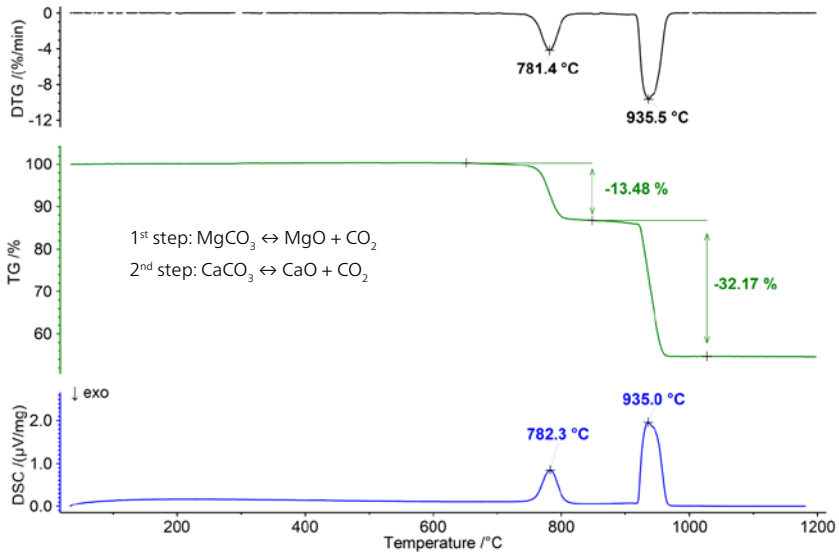

Fig. 2. Measurement on dolomite in CO_2 atmosphere with an STA 449 ***F5*** *Jupiter*®

*Available for STA 449 ***F1/F3*** models

STA 449 Eco-Line

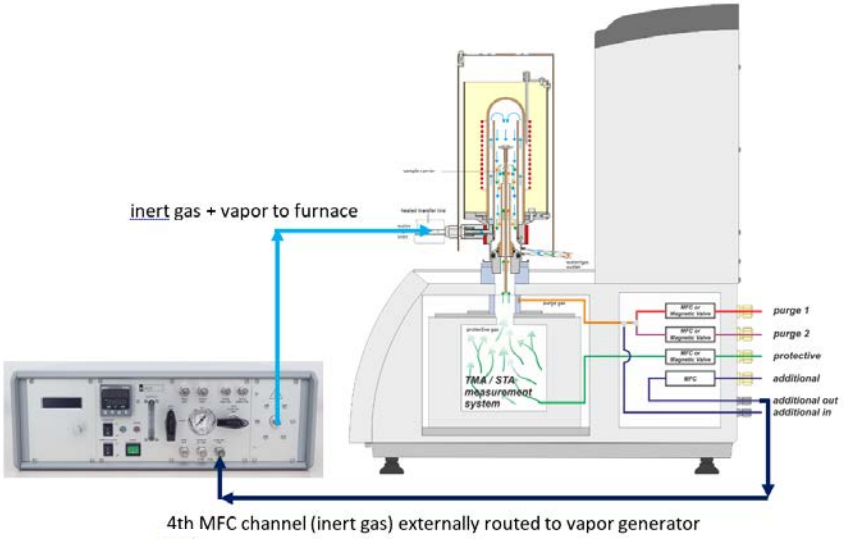

Fig. 3. STA 449 ***F3*** *Jupiter*® with water-vapor furnace and steam generator

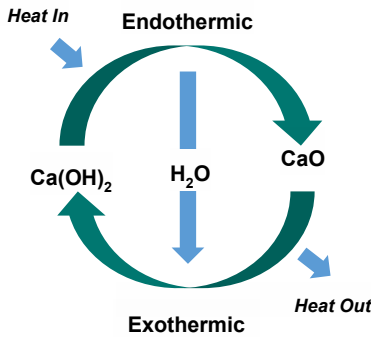

Fig. 4. The $CaO/Ca(OH)_2$ thermochemical cycle

The modular ***F1/F3*** *Jupiter*® models offer the additional capability of special furnaces and accessories designed for measurements under humid or corrosive atmospheres. The unique water vapor furnace (pictured Figure 3) is designed for TGA and DSC measurements to 1250°C in up to 100% steam. The ability to introduce high concentrations of steam at high temperatures makes the setup an ideal tool for studying hydrogen production processes such as thermochemical water splitting. Corrosive gases, including ammonia (NH_3), methane (CH_4), carbon monoxide (CO) and some halogens can be introduced into ***F1/F3*** *Jupiter*® models via special corrosion resistance external MFCs under defined conditions*.

Application Example: $CaO/Ca(OH)_2$ Thermochemical Heat Storage System

Solar energy is one of the cleanest, most promising renewable energy sources available. However, the intermittent and inconsistent nature of solar radiation during the day inevitably leads to imbalances between energy supply and demand. High-temperature thermal energy storage systems are an effective solution to deal with this problem and thus have attracted considerable attention in recent times.

The reversible reaction of calcium hydroxide ($Ca(OH)_2$) to calcium oxide (CaO) and water vapor, ref. Equation (1), is well known in the field of thermochemical energy storage. This system offers relatively cheap material costs, high energy density and a wide temperature range of reaction that can be of benefit for many high-temperature processes [10].

$$Ca(OH)_2 \rightleftharpoons CaO + H_2O \quad \Delta H = \pm 104.4 kJ/mol \quad (1)$$

To confirm the above-mentioned reaction, an experiment was prepared on a NETZSCH STA 449 ***F3*** *Jupiter*® equipped with water-vapor furnace and steam generator. An aged CaO sample (24.52 mg) was placed in an alumina crucible on a TGA-DTA sample carrier. The sample was heated from room temperature to 550°C at 10 K/min under nitrogen atmosphere, followed by an isothermal segment of 1 hour (endothermic calcination step, conversion of all $Ca(OH)_2$ present in the sample into CaO). The sample was then cooled at 10 K/min to 250°C and a subsequent isothermal segment of 2.5 hours was performed under steam atmosphere (N_2+H_20) to complete the exothermic hydroxylation step. This cycle was repeated several times to simulate a typical thermochemical looping process.

As can be seen in Figure 5, the introduction of steam at 250°C results in a mass increase of 29.3% due to hydroxylation reaction. A mass decrease of the same magnitude follows during the subsequent heating (calcination) step to 550°C. The three following test cycles demonstrate the excellent repeatability of the instrument for performing thermochemical looping cycles. Precise enthalpy measurements for the respective cycles are also possible by installing a TGA-DSC sensor.

STA 449 Eco-Line

Carbon capture processes utilize sorbents like CaO for the removal of CO_2 and are emerging as an important technology for reducing carbon emissions in large-scale industrial processes. Similar thermochemical looping processes involving carbonation and calcination reactions can be carried out on the STA 449 *Jupiter*® Eco-Line by using carbon dioxide instead of steam as the reaction gas.

Conclusion

The vacuum-tight STA 449 *Jupiter*® Eco-Line is a highly-flexible materials characterization tool, offering a wide range of bespoke configurations ideally suited to energy materials research. The ability to introduce and switch a variety of purge gases during experiments provides the opportunity for studying thermochemical reactions under varying conditions. In addition to standard inert, oxidizing and reducing atmospheres, the water-vapor furnace* and steam generator* can be used for enthalpy and gravimetric measurements in up to 100% steam at elevated temperatures, as demonstrated in the application example (ref. Figure 5). Measurements under corrosive atmospheres* (e.g., CH_4 or NH_3) are also possible by retrofitting* with a specially designed external mass flow controller.

In our next issue, part 2 of this energy themed series, we will cover further application examples relevant to energy materials research. We will discuss the benefits of using evolved gas analysis for understanding solid-gas reactions and the use of the Pulse Thermal Analysis (*Pulse*TA®) technique for deconvoluting simultaneous chemical reactions not possible with conventional thermal analysis.

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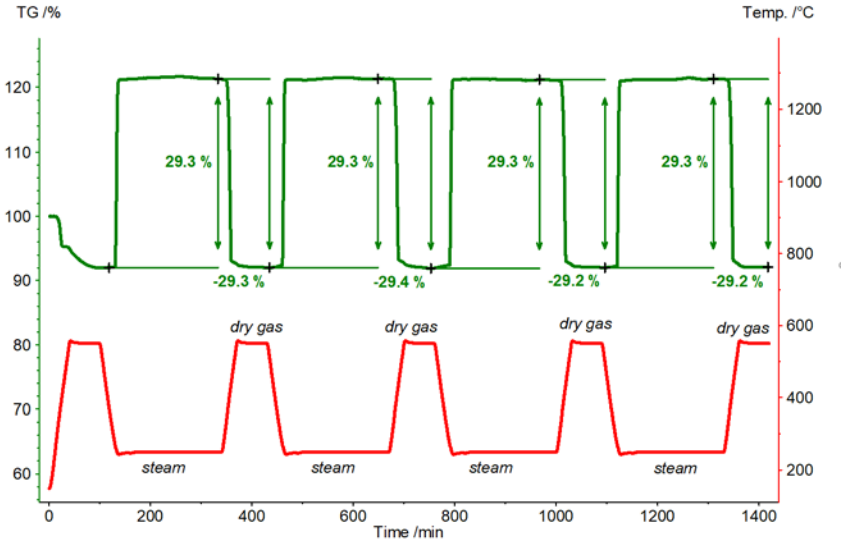

Fig. 5. STA 449 ***F3*** *Jupiter*® measurements demonstrating the $CaO/Ca(OH)_2$ thermo-chemical energy storage system

*Please contact NETZSCH for further information regarding accessories, e.g., water-vapor furnace and atmospheres.
Only mixtures in inert gas with burnable gas content below the gas-specific LFL/LEL (lower flammability limit/lower explosive limit, value in air) are officially acceptable.

Optimize Your Results with the New "Tips&Tricks" Section on our Homepage

Kathrin Frenzl, Marketing

How do I prepare my samples to achieve the best measurement result? What's the maximum temperature at which aluminum crucibles can be used? What properties should I keep in mind when attempting to select appropriate sample holders or measuring geometries?

To achieve meaningful results on the thermal behavior of your samples, it's not just the instrument that needs to be chosen appropriately, but also the crucible material, the furnace and the sample holder.

Today, we would like to introduce you to the new "Tips&Tricks" section on our homepage. Under this category, you will find helpful application tips and tricks that will facilitate your day-to-day work with our NETZSCH instruments.

With the help of our "Tips&Tricks", you can optimize your research and your daily laboratory routine and achieve the best results. Categorized according to the individual thermal analysis methods, you will find various tricks such as:

- How do I clean my Al_2O_3 or Pt crucibles?

Over the course of time, contamination occurs when using the crucibles, which can falsify the measurement results. There are, however, some simple ways to clean the crucibles again so that they can be used several times while still yielding consistent results.

Another example:

- When and why do samples need to be coated for LFA measurements?

LFA is your first choice for measuring the thermal diffusivity of a wide variety of materials. The samples must fulfill a variety of criteria in order to achieve good results, such as opacity in the IR wave range or good absorption capacity. In some cases, it is essential that the samples be coated with graphite or sputtered with gold – this significantly improves the emission properties of your samples. In addition, a graphite coating, for example, prevents the reflection of light.

Read our Tips&Tricks and find numerous other examples that will certainly support you in your everyday laboratory routine!

We will be expanding on our Tips&Tricks offerings continuously and they will be available to you at any time, providing a means by which you can achieve optimum results.

Should you still not find what you're looking for, our experts in sales, the laboratory and the NETZSCH Academy (NOA) will, of course, be happy to assist you at any time.

https://www.netzsch.com/tips_and_tricks

TDP T4 – New Fire Testing Device for Roofs in Accordance with European Standard

Dr. André Lindemann, Managing Director of NETZSCH TAURUS Instruments GmbH

TDP T4 fire testing device for roofs

The choice of appropriate building materials and components is essential in preventing fires altogether or preventing them from spreading. For the building industry, fire behavior including flammability and flames spread is of particular importance. With the TDP T4 fire testing device for roofs, NETZSCH TAURUS Instruments offers a new instrument for determining the behavior of roofs when subjected to external fire loads. Testing is carried out in two stages incorporating an incendiary device, wind and supplementary radiant heat in accordance with DIN CEN/TS 1187.

Fire Tests in Accordance with DIN CEN/TS 1187

The European Standard DIN CEN/TS 1187 specifies four methods for determining the fire behavior of roofs when exposed to external fire. The four methods assess the performance of roofs under the following conditions:

- Method 1: Stressed by an incendiary device
- Method 2: Stressed by an incendiary device and wind
- Method 3: Stressed by an incendiary device, wind and supplementary radiant heat
- Method 4: In two stages, incorporating an incendiary device, wind and supplementary radiant heat

Two-Stage Testing According to Test Method 4

The TDP T4 enables a test in accordance with test method 4. The T4 test evaluates fire spread on the roof surface. Testing is carried out in two stages, the so-called Preliminary Test and the Burn-Through Test. The Preliminary Test determines whether the test sample is ignited by the presence of a simulated incendiary device without being exposed to thermal radiation.

In the Burn-Through test, the fan and the radiant panel simulate additional wind and radiant heat in order to test the flammability of the roof sample under real conditions. To classify the test sample, the duration of the flames, the extent of flame spread, the time and type of roof penetration, and the appearance are all used as well as the dripping and falling of burning or molten material.

Multiple Benefits, Ease-of-Use

With the TDP T4 fire testing device for roofs, testing samples in a frame with the dimensions of 840 mm x 840 mm can be tested. The tiltable sample cover also serves for the testing of special roof pitches specified by the customer. The radiant plate integrated into the solid steel frame can be easily moved from the calibration position to the test position.

Further information on the TDP T4 testing device for roofs as well as the complete range of fire testing instruments can be found here:
https://www.netzsch-thermal-analysis.com/en/products-solutions/fire-testing/

How Does Humidity Affect the Position of the Glass Transition Temperature in Amorphous Materials?

Dr. Gabriele Kaiser, Business Field Management for Pharmacy, Cosmetics & Food

Introduction

The glass transition and the associated glass transition or glass transformation temperature are characteristic for amorphous and semi-crystalline substances, such as those found in the polymer, pharmaceutical and food sectors. The temperature position of the glass transition is decisive for storability, applicability and processability. Water generally causes a lowering of the glass transition temperature. Its influence can be estimated using the empirical Gordon-Taylor equation.

Below the glass transition, the substance in question is a solid glass that transfers into the rubbery state upon heating, with increasing mobility of the molecules or molecular chains and decreasing viscosity. Especially for food, another characteristic parameter is encountered about 20 K above the glass transition temperature; it is known as the "sticky point" temperature [1] and is the point at which a powder begins to stick together and form clumps.

Water as a Plasticizer

As shown in figure 1, water has a plasticizing effect and shifts the glass transition temperature to lower values. Shown are the 2nd heating runs for sorbitol, after rapid, controlled cooling from the melt. Sorbitol is a sugar alcohol that occurs in various fruit. The white crystalline powder is used as a sweetener, but is also employed in toothpastes and cough syrups, and as a laxative. Since it is also hygroscopic, it is also used as a humectant in baked goods and similar applications. [2]

In the present example, the glass transition temperature of the water-free substance was determined to be at -2.9°C (midpoint temperature) or -5.8°C (extrapolated onset temperature) and is thus in very good agreement with literature data (-6°C, also extrapolated onset). [3]

As can be seen in figure 2, the decrease in the glass transition temperature continues with increasing water content (i.e., reducing sorbitol content). A water content of approx. 25% (figure 2) would thus result in a glass transition temperature of approx. -75°C.

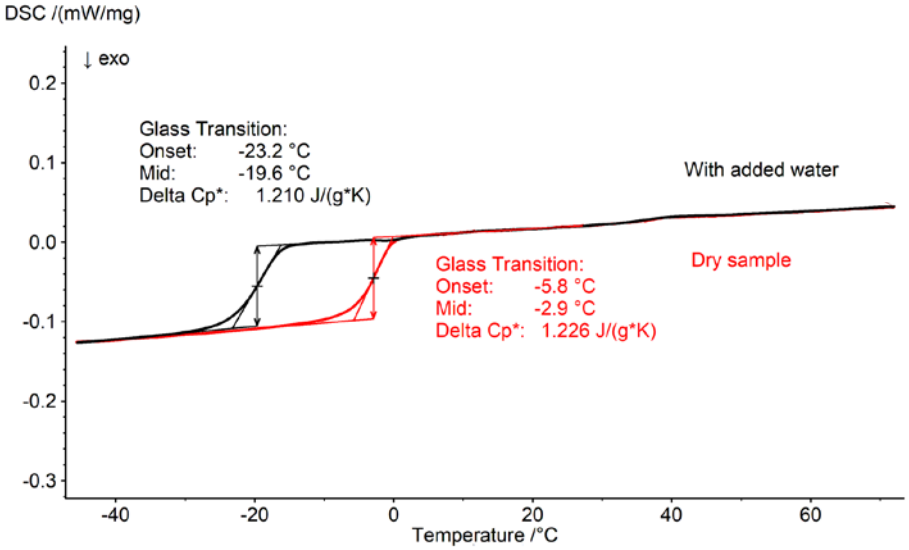

Fig. 1. Comparison of the glass transition of water-free sorbitol (red) and of sorbitol with approx. 6.5 wt% added water (black)
DSC measurements; presented are the corresponding 2nd heating runs after quick, controlled cooling (1st heating to 140°C at 5 K/min,cooling at 10 K/min, 2nd heating to 70°C at 5 K/min); sample masses: 8.61 and 8.97 mg, high-pressure crucibles without gold plating, nitrogen atmosphere

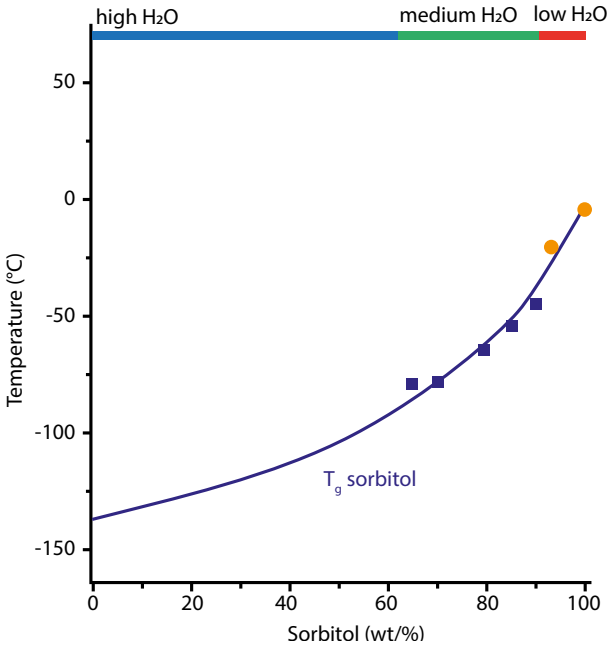

Fig. 2. Sorbitol-water system: Dependence of the glass transition temperature on the sorbitol content (according to [4]); the solid line was obtained by fitting experimental data (■) and literature data by using the Gordon-Taylor equation, based on the respective extrapolated onset temperatures. The orange dots indicate the results of the measurements from figure 1.

The Gordon-Taylor Equation

In 1952, Gordon und Taylor [5] published the following equation to describe the glass transition in copolymers:

$$T_g = \frac{w_1 \cdot T_{g1} + w_2 \cdot T_{g2} \cdot k}{w_1 + w_2 \cdot k} \qquad (1)$$

with T_g: Glass transition temperature of the mixture
w_1: Weight fraction of component 1
w_2: Weight fraction of component 2
T_{g1}: Glass transition temperature of component 1
T_{g2}: Glass transition temperature of component 2; in the case of water: -137 °C, according to [4]
k: Gordon-Taylor constant, dimensionless for the sorbitol-water system: 3.1 ± 0.2, also according to [4]; for the following calculation, 2.9 is used as the lower limit of the interval

This equation refers to binary mixtures and is only valid as long as the substances used do not interact with each other and complement each other ideally in volume (i.e., do not contract or expand during mixing). The range of validity of the equation, however, is not limited to polymers; it can also be applied to substance-water mixtures, for example.

The Gordon-Taylor constant parameter, k, describes the extent to which the amorphous solid is affected by the water present. In situations where the k parameter is larger, the plasticizing effect of water is more pronounced. [6]

If, while using, -137°C as the T_g of water and 2.9 as the Gordon-Taylor constant at the same time – the corresponding quantities from figure 1 are included in the Gordon-Taylor equation (1), a glass transition temperature (extrapolated onset) of -27.8°C is calculated; this value lies about 4 K below the temperature determined in the experiment. Thus, the results do a good job of reflecting the tendency for temperature to decrease as water content increases (see figure 2).

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Saving Energy and Time with the New HFM 446 Eco-Line

Christina Strunz, Applications Laboratory

Fig. 1. The new HFM 446 *Lambda* Eco-Line

Introduction

The human population is constantly growing, and with it, the consumption of energy which has been provoking a severe shortage of fossil fuels in recent times. In particular, the energy efficiency of buildings plays a preponderant role, and is at the core of multiple research projects around the globe.

Within the European Union, half of the energy consumption is attributable to heating and cooling in buildings. This constitutes the main energy end-use sector, leading ahead of transport and electricity. Increases in living standards and the resulting need to ensure active indoor thermal comfort are the main reasons for this phenomenon.

The fact that merely some 22% of the energy spent for heating and cooling comes from renewable sources, while approximately 75% is still generated from fossil fuels, makes matters worse. Considering the EU's target of becoming CO_2-neutral by the year 2050, the heating and cooling sector is in need of major advances in energy efficiency, building sustainability and a reduction in fossil fuel consumption. [1, 2, 3]

HFM – Impact on Environmental Protection

In recent decades, the Heat Flow Meter method has become the industry standard for assessing the thermal performance of insulation materials. It enables the determination of the key parameters in this field: the thermal conductivity (λ) and its reciprocal, the thermal resistance (R-value). The lower the thermal conductivity, the better the insulation performance and, consequently, the lower the energy consumption for heating or cooling. The HFM is therefore crucial in developing and assessing improved building insulation.

HFM 446 *Lambda* Eco-Line

Latest Improvements

Our NETZSCH HFM not only allows for accurate investigation of insulation materials, but it now also does so in a much more environmentally friendly way. With the launch of the new HFM 446 Eco-Line (figure 1), measurements run up to 40% faster (figure 2); thus, unequivocally consume less energy. Additional energy savings are enabled by the Idle/Eco Modes, which allow for a definable weekly schedule according to the users' needs.

The new HFM 446 Eco-Line also boasts severall performance improvements: Enhanced stability criteria management and more extensive calibrations allow for higher accuracy. The "drive-to-thickness" feature makes it much easier to achieve precise measurements on compressible samples. Moreover, an increased number of possible measurement points allows for higher efficiency.

Worth mentioning are also the new software and the more intuitive user interface along with the intelligent notifications in *SmartMode*, allowing for better information and support when working with the NETZSCH HFM 446. Last but not least, all existing HFM 446 instruments can easily be upgraded to the new Eco-Line.

Want to Know More?

For more precise information about the HFM method itself, have a look at our website [4] and don't hesitate to contact our specialists for specific requests.

Additionally, don't miss our latest Application Note, "Saving Energy and Time with the New HFM 446 *Lambda* Eco-Line" [5], which elaborates on the numerous improvements of the new HFM Eco-Line.

References

[1] L. Pérez-Lombard, J. Ortiz, C. Pout, A review on buildings'energy consumption information, Energy and Buildings 40 (3) (2008) 394–398.
[2] N. Soares, J.J. Costa, A.R. Gaspar, P. Santos, Review of passive PCM latent heat thermal energy storage systems towards buildings' energy efficiency, Energy and Buildings 59 (2013) 82–103.
[3] Heating and cooling | Energy (europa.eu)
[4] NETZSCH Thermal Analysis Products and Solutions: HFM 446 *Lambda* Eco-Line
https://www.netzsch-thermal-analysis.com/en/products-solutions/thermal-conductivity/hfm-446-lambda-eco-line/
[5] NETZSCH Application Note 223: Saving Energy and Time with the New HFM 446 *Lambda* Eco-Line.

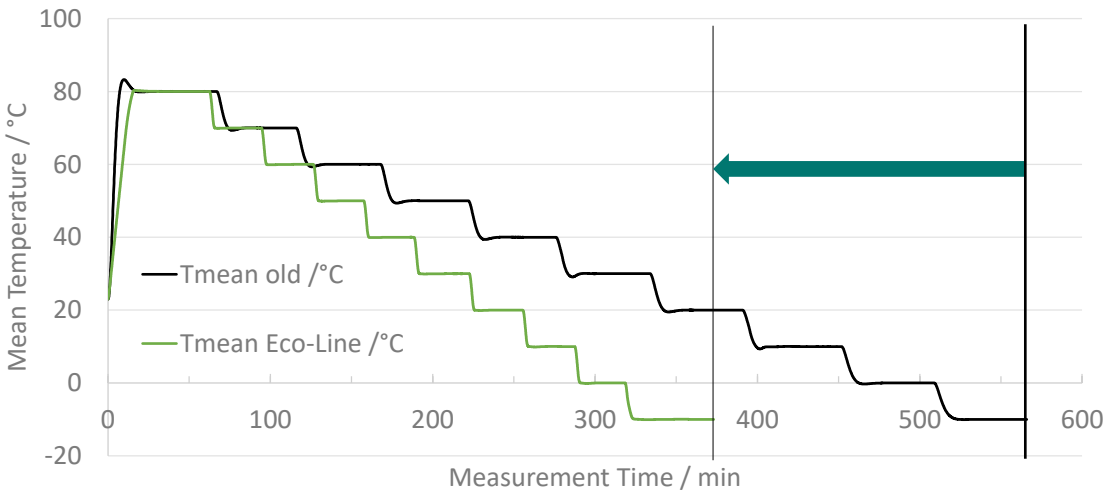


Fig. 2. Mean temperature course of an HFM 446 *Small* Eco-Line vs. older models during a measurement on NIST SRM 1540d (10 set points, ΔT = 20 K)

NETZSCH DEA – From the Laboratory to the Shop Floor

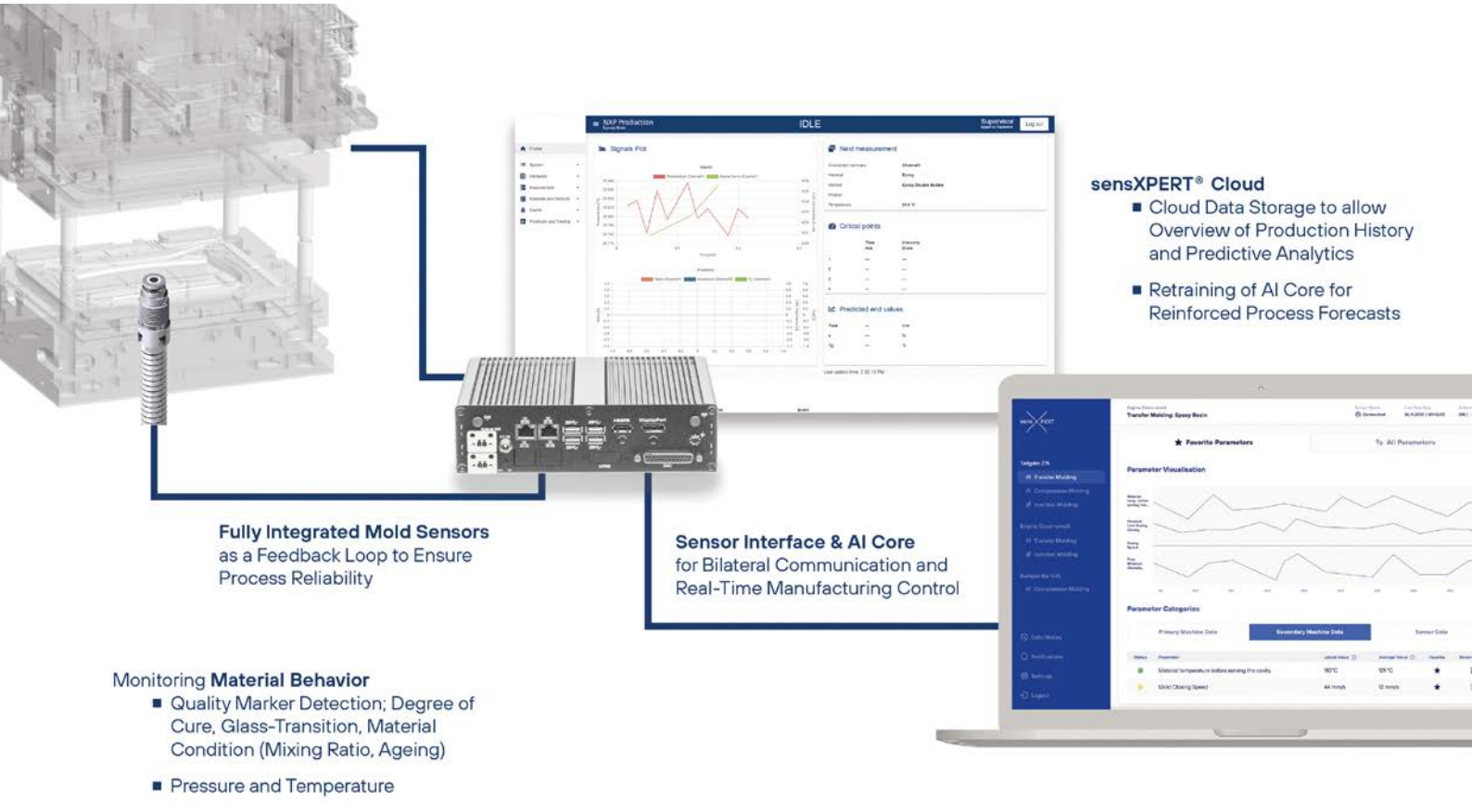
Milena Riedl, Content Marketing, and Cornelia Beyer, Managing Director NXP

The NETZSCH Analyzing & Testing Business Unit is pleased to announce the launch of NETZSCH Venture NXP to send out a clear signal that WE not only understand our customers' needs for new intelligent process analysis and optimization solutions, but also provide them with new satisfactory products.

Over the last 1.5 years, a select team of experts dedicated their time to master the development of a highly reliable measurement technique to ensure manufacturing process control on an entirely new level.

Unique NETZSCH DEA sensors, combined with edge device (data interface between the sensors and cloud), machine-learning algorithms and an intuitive cloud application provide the basis for real-time process technology.

In August this year, the newly found company NETZSCH Process Intelligence GmbH (NXP) introduced its kick-off product under the brand sensXPERT®. With the support of pre-selected test clients, NXP will serve various industries ranging from the automotive, to the aviation and to the construction industries.



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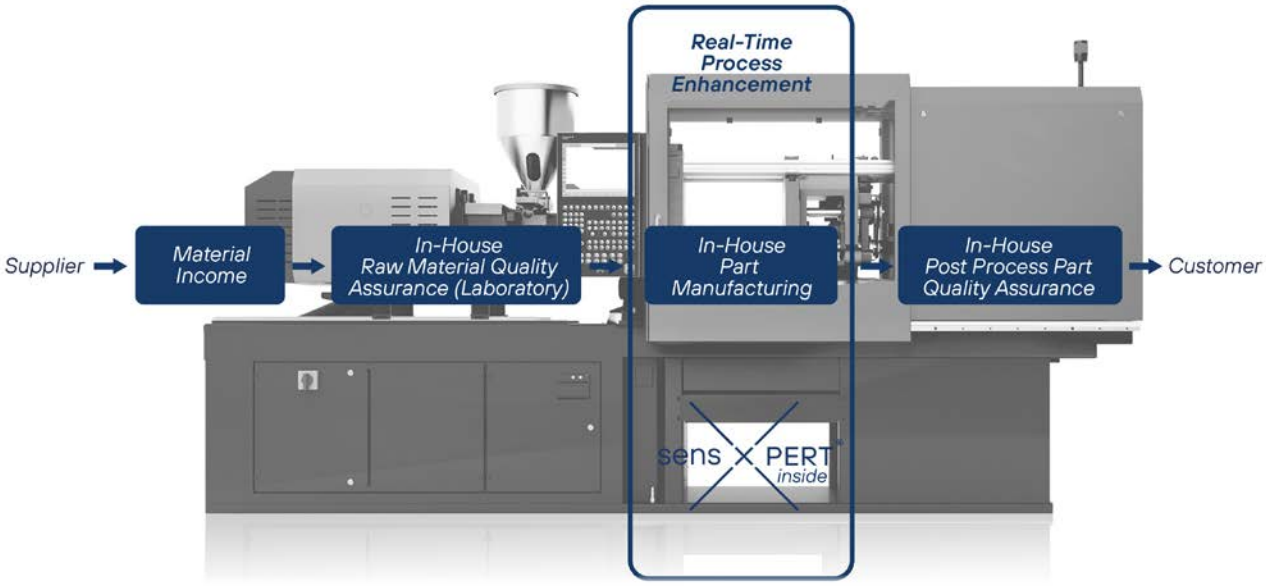


Win-Win for All Parties: The NETZSCH Laboratory DEA Expands its Reach

In close cooperation with decision-makers from the plastic industry, the task force has identified key manufacturing challenges. Raw material deviations, prolonged cycle times and costly trial & error processes result in significant productivity losses. Further, plastics manufacturers work hard to optimize scrap, identify and solve efficiency issues, and avoid downstream costs.

Tradition Meets Innovation

- Solution-as-a-Service model for cost efficiency and fast return on investment
- Durable DEA sensors become part of the mold and measure the real-time material behavior while it is processed.
- Edge device with sensor interface and machine-learning algorithms, predicting the sweet spot for demolding and dynamically adapting the manufacturing process
- sensXPERT® cloud for intuitive dashboards, total process transparency and data management

sensXPERT®: In a Nutshell

- Dynamic process control by adapting cycle times to real-time material behavior
- Securing continuous product quality and minimizing scrap
- Tapping the full potential of efficiency potentials of equipment during the entire manufacturing process
- Complete process visualization and transparency across multiple plants and productions lines by means of the intuitive sensXPERT® cloud

Learn more about us and our products and become part of the sensXPERT® community!

info@sensxpert.com
www.sensxpert.com

And here, you can watch our latest video (in German):

https://www.youtube.com/watch?v=x0LB3cry7HE

Outlook

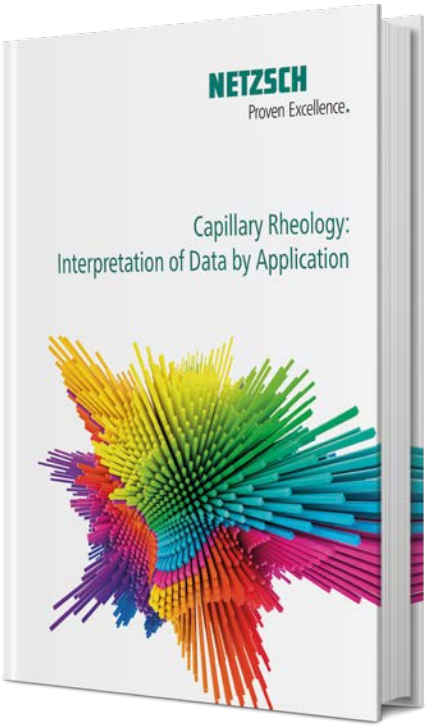
Coming Soon ...

We are excited to share the news with you that we will soon be releasing our new capillary rheology booklet!

This new booklet delivers an introduction to the technology and subject area, discusses application examples, shows how to characterize fundamental material properties and provides measurements using advanced techniques.

The booklet provides an insight into how shear and extensional properties can influence behavior in application, whilst allowing processing problems to be investigated and production to continue on the factory floor. This highlights the importance and benefits for the material producer, processor and researcher.

Get in touch to pre-order your booklet now!



Events

60 Years of NETZSCH-Gerätebau GmbH – A Reason to Celebrate!

In 1962, the success story of NETZSCH-Gerätebau GmbH at the Selb site began. In the last almost 60 years, we have become one of the leading manufacturers in the field of thermal analysis, and we are proudly looking forward to celebrating our company's anniversary next year.

In a year-round campaign, we will be featuring one of our instruments each month and highlighting its development over the past decades. You can look forward to exciting, elucidating, peculiar and just plain funny stories from 60 years of NETZSCH instrument manufacturing.

During the course of our anniversary year, we'll be introducing our methods and the stories behind them in various mailings – so don't miss this opportunity to sign up for our newsletter:

https://www.netzsch.com/newsletter

Further Information can be found at

https://ta-netzsch.com/60-years-netzsch-analyzing-and-testing

We also need your help! Who has the oldest devise still in use? Send a photo and some details to us at

ngb_marketing@netzsch.com

and win a voucher in the amount of € 1,500, e.g., for purchasing an accessory or spare part or booking customer training!

We will start in January 2022 with the dilatometer, one of the oldest instruments in our company history.

NETZSCH

Proven Excellence.

Imprint

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