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I-CAL FLEX

CALMETRIX I-CAL FLEX FOR THE MATERIAL SCIENCES

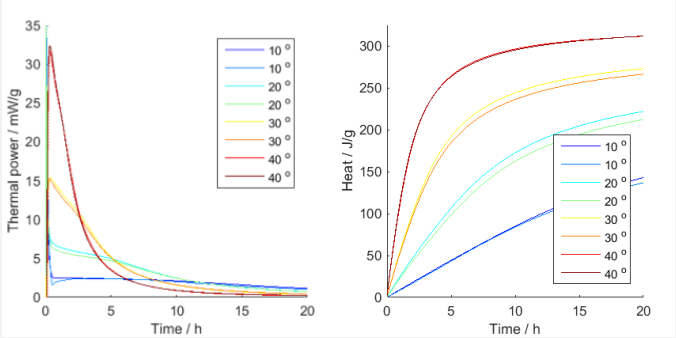
About Isothermal Calorimetry in Material Science.

Material Science studies the composition, properties and applications of materials used in every aspect of human activity. Isothermal calorimetry measures the heat released by any chemical or physical reaction in an active sample while the surrounding temperature is maintained constant.
Isothermal calorimeters are different and complementary to other commonly used types of calorimeters, such as differential scanning calorimeters, where the temperature is gradually increased during a test to study phase changes on a very small sample.

I-Cal Flex: a versatile tool for Material Scientists.

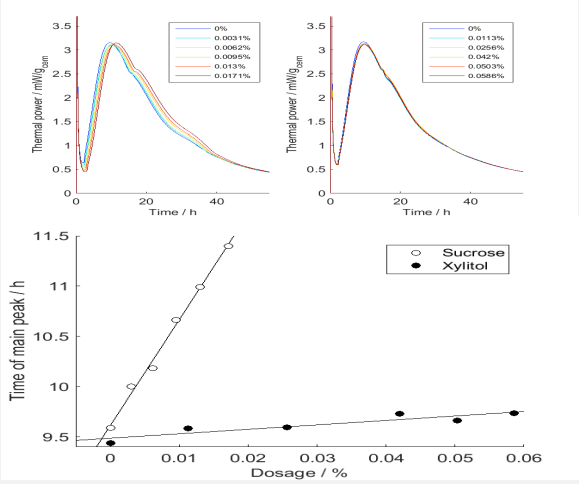
The Calmetrix I-Cal Flex is a highly versatile isothermal calorimeter suitable for a broad range of applications in Material Science. The I-Cal Flex has the highest performance specifications in its class, and it is flexible in every way: its design allows for up to eight sample cells of 20 ml capacity suitable for smaller or homogeneous samples such as metals, or polymer resins, but also for two large sample cells of 450 ml capacity that will generate better results for larger and inhomogeneous samples such as wood, certain ceramic materials, cement materials, or more complex or layered materials. The 20 ml and 450 ml cells are seamlessly interchangeable and are placed in the I-Cal Flex thermostat with a temperature stability of +/- 0.005 °C and an operating temperature range of 2°C to 90°C.
The Calmetrix team has decades of real life experience with calorimeters used in research laboratories and industry. We not only understand calorimetry, but also have a deep knowledge and a genuine understanding of practical applications in multiple industries. Each purchase of a Calmetrix instrument includes our lifetime support with experimental procedures and with data interpretation.

Example: Curing of a polyurethane sealant



This example illustrates the measurement of a polymerization reaction in an isothermal calorimeter, in this case the curing of a polyurethane sealant. The graphs show the thermal power (left) and total heat of reaction (right) of the reaction at different ambient temperatures, from 10°C to 40°C. The thermal power is a measurement of the kinetics of the reaction, directly proportional to the rate at which monomers convert into the polymer. The heat is proportional to the total progression of the reaction. Such kinetics and progressions can be followed in real time and minute by minute. Test results are easily interpreted to assess the influence of temperature on the efficiency of polymerization.

Example: effect of two retarders on cement hydration



This example shows how to quantify the effect of xylitol and sucrose on the delay of the alite reaction in a Portland-limestone cement paste.

The effect of retardation can be seen in the shift of the main peak of reaction as both the sucrose (left graph) and xylitol (right graph) were added in increasing dosages. The dosage increment was 0.0031% for the sucrose and 0.0113% for the xylitol.

By plotting the retardation (time of main peak) as a function of dosage, it can be seen that the response to dosage increments for both components is linear, although the sucrose has a stronger retarding effect than the xylitol, by a factor of 25.

Applications.

Isothermal calorimetry is suitable for a number of applications in Material Science. Sample preparation and interpretation of results usually takes only minutes, and the continuous measurement of reaction kinetics gives a wealth of information that cannot be derived from most traditional physical testing.

Plastics

Polymerization
Hardening / drying of resins
Oxidation of polymers
Adhesive curing
Efficiency of stabilizers

Metals

Corrosion rate in metals / alloys
Influence of storage conditions
Battery testing

Other Materials / Applications

Cement hydration
Package – product compatibility
Alkaline hydrolysis
Wood rot
Amorphous vs. Crystalline phases

Specifications

Specifications			
Operating Voltage	110 - 240 VAC - 50/60Hz	**Number of test channels**	1- 8 (user defined)
Sample size	Choice of up to 20 ml / up to 450 ml	**Baseline* (24 hours)**	
Operating Temperature Range	2 °C to 90 °C	**Drift**	< 5 µW
Temperature Stability	+/- 0.005 °C	**Random noise**	< +/- 1 µW
Detection Limit	2 µW	**Dimensions**	L17"xW13"xH19" (43 cm x 33 cm x 48 cm)
Precision*	+/- 2 µW	**Weight**	75 lbs (34 kg)

* As measured in the 20 ml vial calorimeters

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Ihr Ansprechpartner in der DACH-Region:

C3 PROZESS- UND ANALYSENTECHNIK

C3 PROZESS- UND ANALYSENTECHNIK GMBH
Peter-Henlein-Str. 20 I DE 85540 Haar
www.c3-analysentechnik.de I info@c3-analysentechnik.de