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PRODUCTS + INSTRUMENTS

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MWS mid-IR Temperature Measurement

Optical Temperature Control

Basic Demands Made on the Measuring Technique

The extremely rapid heating of sample material in a microwave field coupled with spontaneous reactions which may occasionally be induced make the employment of a temperature measurement system which can react with appropriate speed essential in order to ensure efficient and safe reaction monitoring or microwave control. In addition, the sensor must be resistant to chemicals, particularly mineral acids, while at the same time it must not make handling the vessels more difficult in order to avoid unnecessary safety hazards and costs resulting from damage or incorrect operation.

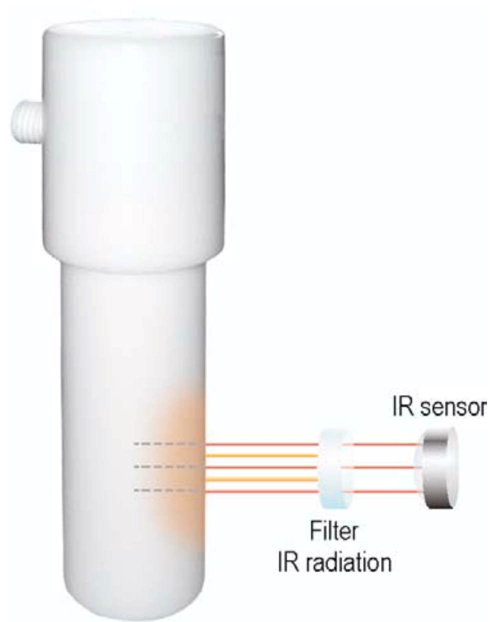
With these demands in mind, the temperature sensors frequently employed in single reference vessels are simply too expensive, too difficult to handle, and are too easily subject to damage. Further, some type of fluoropolymer housing or sheath is required, but the good thermal insulation properties of this material mean that system reaction times are increased. The following applies with respect to the conventional, broadband IR measurement technique that is frequently employed in conjunction with a reference vessel: It is only capable of detecting the exterior surface temperature of the vessel and is therefore correspondingly slow.

MWS mid-IR (Optical Temperature Control) BERGHOF Temperature Measurement

Solid bodies such as digestion vessels absorb the entire thermal radiation detected by broadband measuring instruments which is why only the vessel surface temperature can be detected. Alternatively however, it is also possible with BERGHOF patented **MWS mid-IR** technology to detect the thermal radiation in the middle IR range where it cannot be absorbed by TFM and quartz. This allows the thermal radiation of the sample solution to be detected directly. In addition, the accuracy of the process is improved by filtering out the IR radiation given off by the pressure vessel surface. This allows sample temperature measurements to be made in real-time.

Technical Specifications

Measurement range: 100 - 300°C
Accuracy: ± 1°C at 200°C



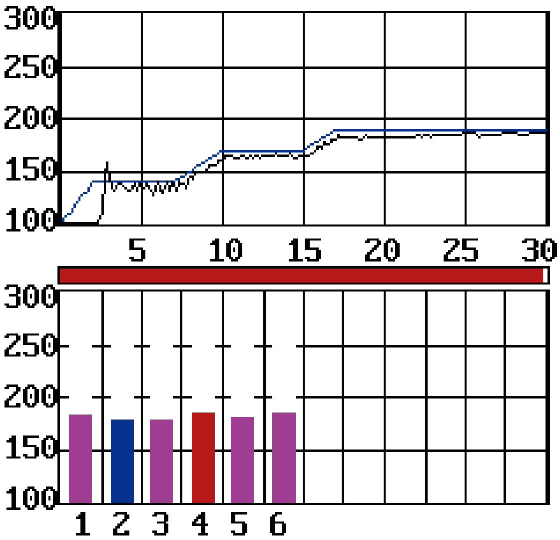
Advantages

- The sensor lies outside the microwave field.
- The temperature of each sample is recorded after each turntable rotation (approx. 10 sec.). For method development, a single vessel can be positioned directly in front of the sensor, thus reducing the measurement interval to < 1 sec.
- No sensor inside the pressure vessel to be mounted, removed, and cleaned for each digestion.
- No risk of sensor corrosion.
- Absolute chemical resistance is assured.
- No risk of sensor damage as a result of frequent sensor installation and removal.
- No risk of sample contamination by sensors mounted inside the vessel.
- Pressure vessels require no additional connections for sensors and can therefore be optimally manufactured with smooth surfaces and without “dead” volumes.
- Only a single sensor is required per device, making the method very economical.

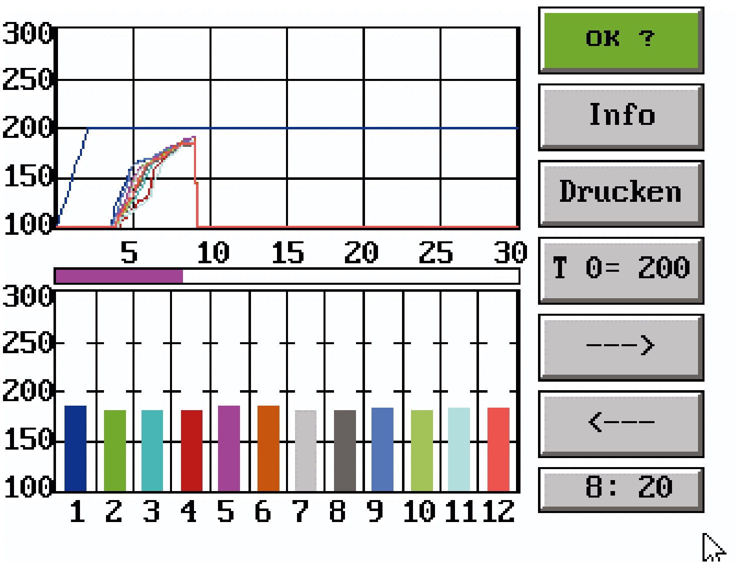
Detection of rapid exothermic reactions

Digestion of 6 reference materials with 5 ml HNO_3 / 2 ml H_2O_2

- 1, 2: 500 mg leaves
- 3, 4: 500 mg grass
- 5, 6: 500 mg tomato leaves



Rupture disc breakage



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Ideen werden wahr.
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