



MWS OPC Pressure Measurement

Optical Pressure Control

Basic Demands Made on the Measuring Technique

In order to achieve optimum reaction monitoring or microwave control during microwave-heated digestion processes where the temperature increases rapidly, the ability to monitor not only the sample temperature but to also continuously monitor the pressure in all pressure vessels is advantageous. This allows appropriate steps to be taken to counteract any spontaneous reactions which may occur and thus prevent the overpressure protection from triggering which would result in the loss of the samples. Beyond this, the special ambient conditions that exist in a microwave digestion system make various demands on the sensor. It 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. In addition, sensor function must not be influenced by strong microwave fields; shielded sensors are rarely completely free from interference.

With these demands in mind, the pressure sensors frequently employed in single reference vessels are simply too expensive, too difficult to handle, and are too easily subject to damage. Further, guiding reactions based on measurements made in only a single reference vessel is only practical to a limited extent since samples that are being simultaneously digested never exhibit exactly the same behavior.

MWS OPC BERGHOF Pressure Measurement

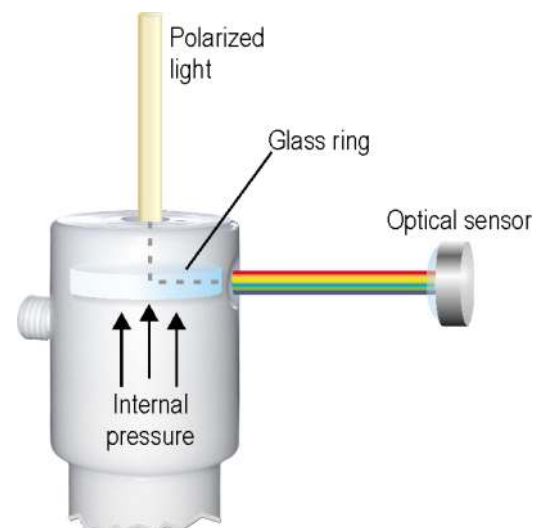
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BERGHOF has therefore developed a special “contact-free” measuring principle for microwave digestion systems, named **MWS OPC**. The sensor element is a simple glass ring, permanently integrated in the pressure vessel lid and illuminated by polarized light. The value measured is the color change in the polarized light resulting from the change in optical properties of the glass ring with increasing pressure in the vessel. The interior vessel pressure is transferred to the glass ring through the TFM lid with its sliding lip seal. The glass ring on each digestion vessel is mounted in such a way that it does not need to be reinstalled for every new digestion procedure and therefore the ring has absolutely no effect on vessel handling. The zero point and pressure increase are automatically adjusted at the start of each procedure, making regular recalibration unnecessary.

Technical Specifications

Measurement range: 0 - 120 bar

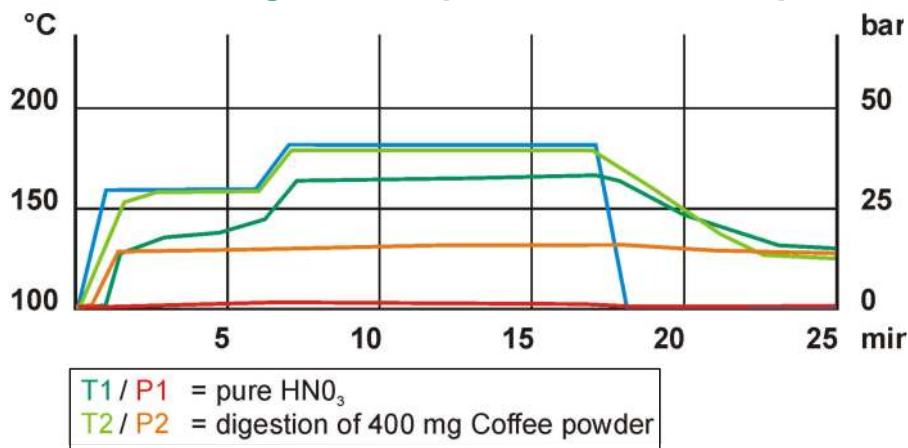
Accuracy: ± 5 bar



Advantages

- The light source and the detector lie outside the microwave field.
- The pressure in each vessel 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 once per second.
- 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 installation and removal. Only the extremely economical glass ring needs to be occasionally replaced.
- 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.

Influence of organic sample material on the pressure



Rupture disc triggering is avoided

