Technical Data

- Height x weight x length: 2500 x 1000 x 2600 mm³
- Maximum temperature: up to 2200°C
- Heaters: Graphite (standard), Molybdenum, $MoSi_2$
- Atmospheres: Oxidizing (only with $MoSi_2$-heaters), vacuum, inert, reducing
- Measuring window diameter: 60 mm
- Resolution: 0,4 µm

Customer Benefits

- Non-contact optical measuring mode
- No mechanical impact on the sample
- Atmosphere control during heat treatment
- No interface reactions or caking
- No movable mechanical parts
- Two-dimensional dimension measurement
- Simultaneous measurement of up to 20 parameters
- Simultaneous measurement of up to three samples
- Low noise an high reproducibility

Fraunhofer-Center HTL
is certified acc. to ISO 9001:2015

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Center for High Temperature Materials and Design HTL

ThermoOptical Measuring System TOM_ac

TOM_ac

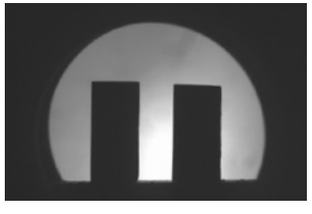
TOM_ac is a vacuum tight measuring furnace, offering a non contact dimension measurement of samples at high temperature. It enables in situ measurements during the heat treatment of materials in controlled atmosphere.
Measured phenomena are:

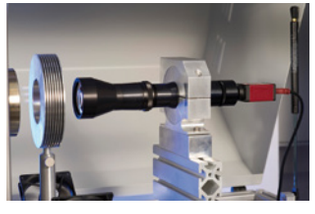
- Thermal expansion
- Sintering
- Deformation
- Wetting

Heterogeneous and weak samples and samples of irregular shape can be investigated. A very high accuracy and reproducibility is achieved by a special optical system and smart image analysis software. The user defines measuring windows to obtain quantitative information on height, width or other geometrical properties. Up to 20 quantities can be measured simultaneously.

Auxiliary equipment enables investigation of additional phenomena at high temperatures:

- Creep
- Viscoelastic behavior
- Adhesion
- Crack formation
- Weight changes
- Infiltration





Applications

TOM_ac is used for heat treatments in vacuum, inert or reducing atmosphere. It enables investigations of many materials like powder metals, non-oxide ceramics, slags or melts.

Powder metals and ceramics are densified and strengthened by sintering. Sintering shrinkage is the most telling indicator for the sintering state. TOM_ac monitors shrinkage and warping at high temperatures. Reproducibility of shrinkage curves is within 0,1 %. This excellent reproducibility allows the use of TOM_ac for the control of green body homogeneity. Binder pyrolysis is measured by an auxiliary thermo balance. An acoustic emission analysis can be installed to monitor crack formation during the heat treatment. Viscoelastic properties are measured by a loading station.

High temperature investigations of weak materials like slags and melts are especially difficult. Dimensional changes during heat treatment can be investigated by TOM_ac. With the thermo balance all kinds of reactions can be studied simultaneously. Wetting properties are studied by the sessile droplet method and contact angles are monitored versus temperature or time. Due to the large sample volume significant results are obtained even for heterogeneous materials. Also infiltration of melts into porous samples can be investigated.

Technical Solution

TOM_ac combines a vacuum tight furnace with an optical dilatometer. The sample is evenly illuminated by an LED array. Its crosslight silhouette is recorded by a CMOS camera in a telecentric beam path. Dimensional changes of the sample are registered by a purpose-made image analysis software; the sample may be of any shape up to a size of about 40 mm.

TOM_ac is controlled by a standard PC and operated via a comfortable graphical user interface. The user defines the position of measuring areas or lines by setting specific windows within the contour image. These windows are adapted during the heat treatment to consider changes of sample geometry and position. Several images are averaged to reduce thermal flickering in dimension measurement. Besides the data on dimensional changes, single images as well as timelapsed videos of the thermal treatment can be obtained.