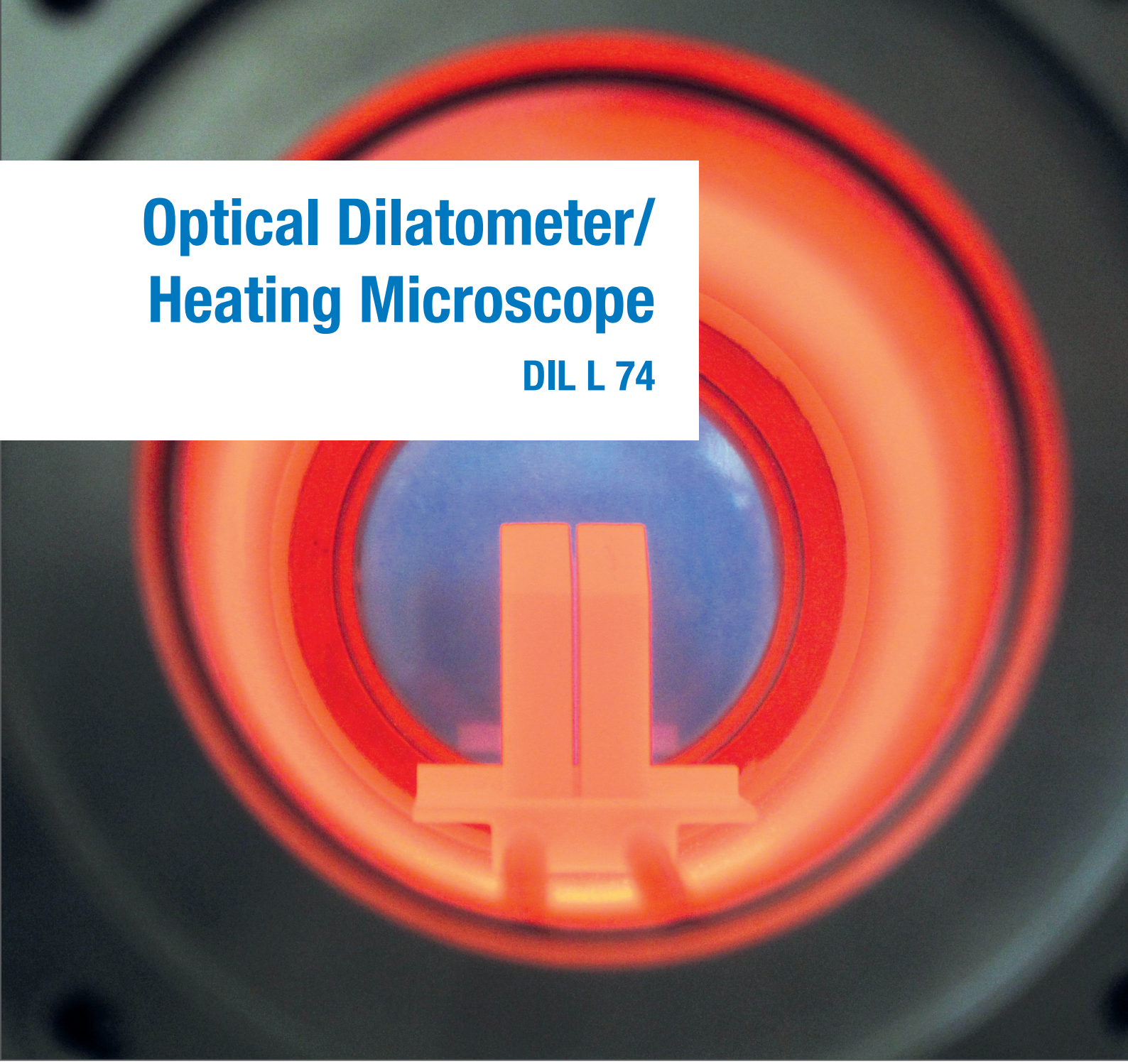


Optical Dilatometer/ Heating Microscope

DIL L 74

LINSEIS

General

The Optical Research Dilatometer L74 was developed to meet the demanding applications of the glass, ceramics, metal and energy industry. A high resolution CCD camera enables a visual real time analysis of the sample expansion, either as single frame or as video sequences.
The big advantage of this method is that the sample is not burdened with any force. For soft samples or samples that melt during the measurement , this leads to a result, which is not distorted by the contact pressure.

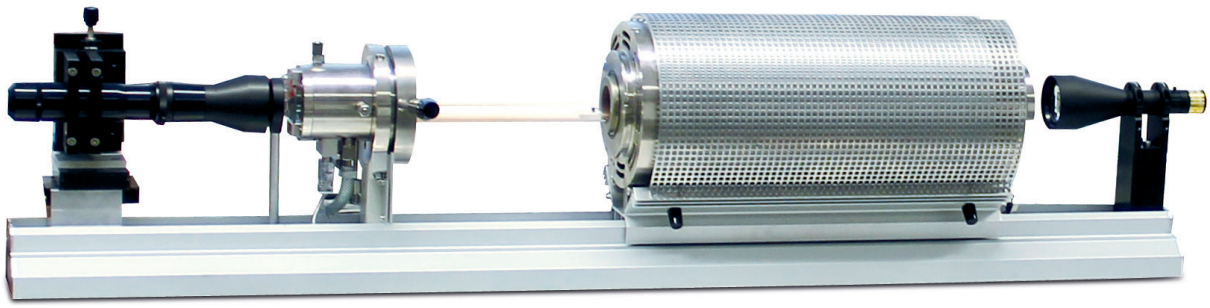
Several correction and analysis features are incorporated into the LINSEIS Evaluation Software. The unique horizontal design enables most demanding applications. The special solid-liquid adapter allows expansion / volume measurements of solids, liquids and solid – liquid phase transitions. There is also a special sample holder for measuring rigid foils available, which avoids measurement errors due to pushrod forces like in a classical dilatometer.

Application

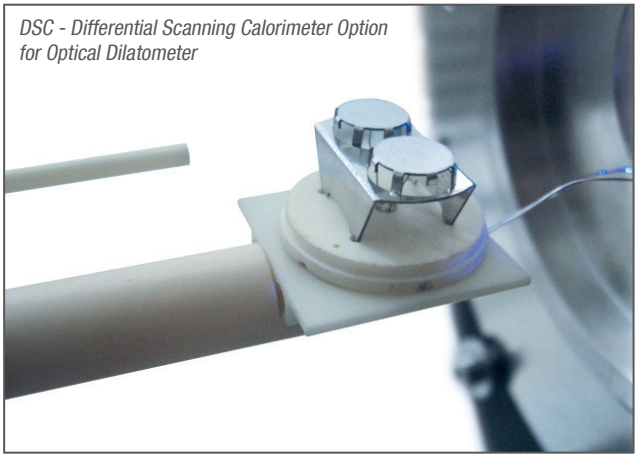
- Heating microscope
- Optical Fleximeter
- Non contact Expansion measurement
- Sessile Drop
- Contact angle
- Solid-liquid expansion – (optional adapter)

Industries

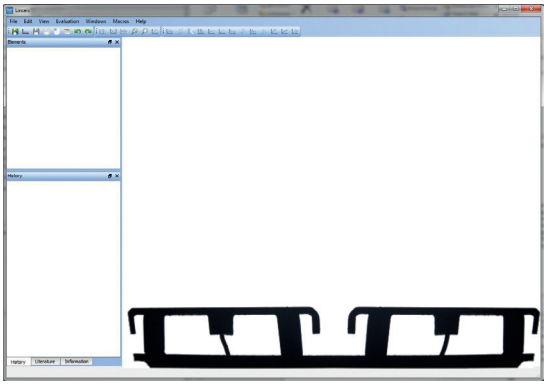
- Glass
- Metal
- Enamel coatings
- Ceramics
- Energy



DIL L74 Optical Dilatometer



DSC - Differential Scanning Calorimeter Option for Optical Dilatometer

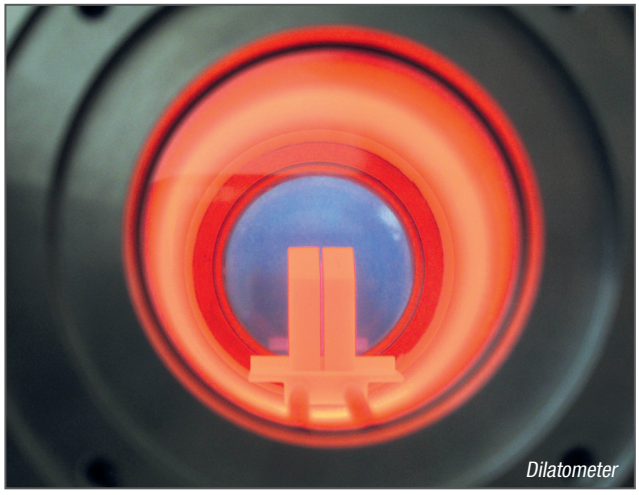


DSC - Differential Scanning Calorimeter Option for Optical Dilatometer

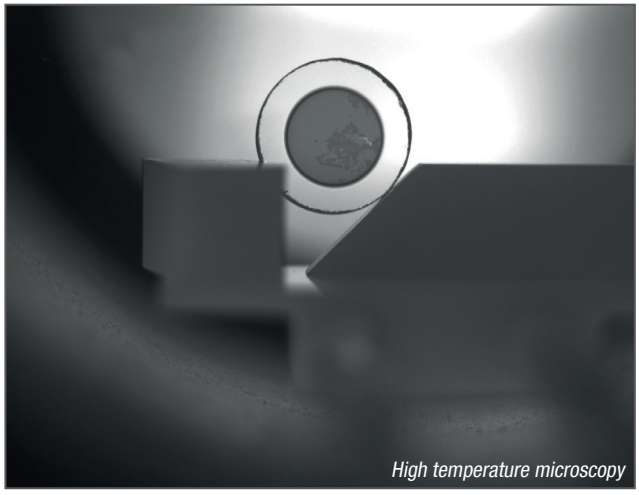
Optical Dilatometer

Sintering

The investigation of sintering processes using pushrod dilatometers has one disadvantage: There is always a force in z-direction that can cause a certain sinter direction. The optical dilatometer instead is able to measure a sinter process completely contact free and guarantees that the sintering process can take place without any influence. If you compare
the results of the same substance that was sintered on an optical and on a pushrod dilatometer, there can be big differences because of this effect.



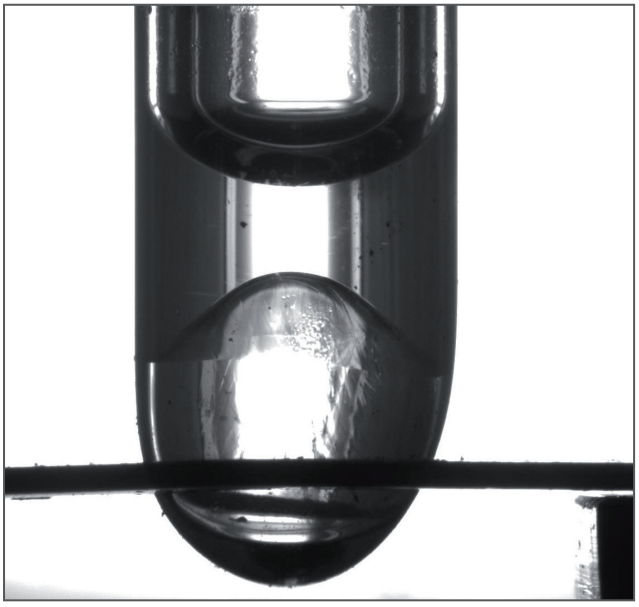
Dilatometer



High temperature microscopy

Liquid applications

The optical dilatometer can also be used to investigate the behavior of melts and liquids. The contact angle as well as sphere and half sphere point can be detected and this can provide information about the surface tension of the liquid. Also the moistening behavior and volatilization can be detected and monitored, what is impossible to do on a classic pushrod dilatometer.



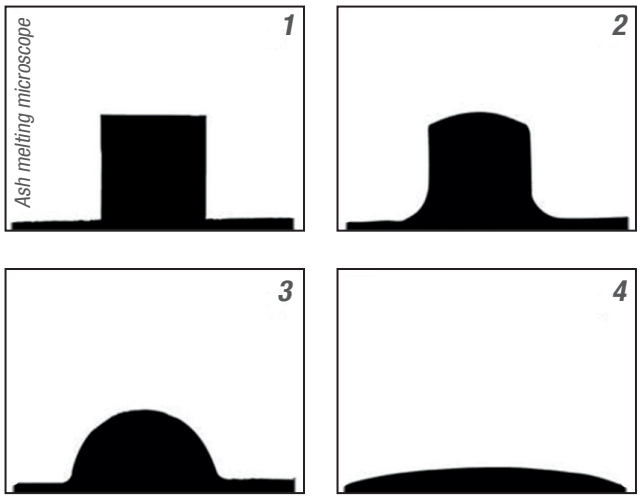
Heating Microscope

Applications

- Ash fusion microscopy
- Observation and analysis of sintering processes
- Contact angle determination
- Microscopy at high temperatures and under different atmospheres

Ash melting microscope

Ash melting of a coal sample



1 – Softening temperature = edges are getting round

2 – spheric temperature = round shape of height that is as big as its baseline

3 – half sphere temperature = half sphere shape of height that is half the size of its baseline

4 – flow temperature = sample is nearly liquid, has only one third of the size of half sphere point

General

Solid ash fuels consist of inorganic compounds like silicon oxide and alkali oxides. Due to the high diversity of ash compositions it is nearly impossible neither to define a universal melting point nor to determine a fuel specific melting point. The melting behavior of ashes is heavily dependent on its chemical composition. The melting procedure of ashes takes place in a broader temperature range. Even if the slagging problems of power plants are different from each other, the melting behavior of ashes is useful to get a qualitative analysis of the slagging behavior of different coals what gives a result that can be applied to the corresponding boiler. The ash melting behavior of coals is determined according to DIN 51730, for bio mass there is a pre norm DIN CEN/TS 15730 that can be used as well. It defines four characteristic temperatures under oxidizing atmosphere.

Functional Principle

The principle of determination of the ash melting behavior is based on a sample that is melted under defined temperature ramps. The melting temperatures for stone coal are up to 1600°C, for bio mass and wood they are at around 1200°C to 1300°C and for culm containing bio mass they are even lower. The evaluation is done automatically according to DIN 51730 by monitoring of a shadow profile of the sample where the change of geometry is documented. By means of operating geometric factors, the resulting characteristic temperatures can be determined and be used for comparison of different coal qualities.

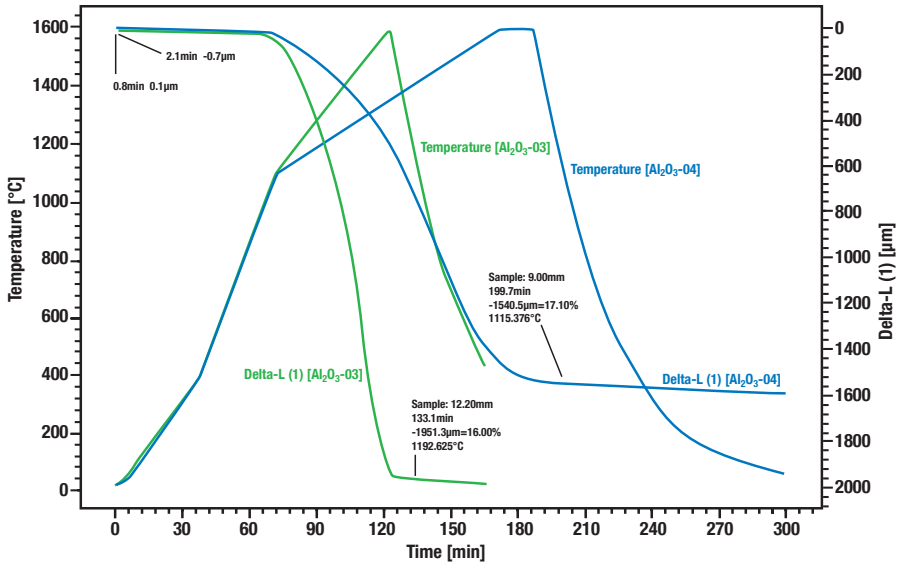
Fields of Application

- Measurements according to DIN 51730 (1984, 1998) / ISO 540-1995
- Characteristic temperatures plus start of sintering / sintering point
- Ash melting behavior
- Sintering behavior
- Dilatometric curves (e.g. shape, area)
- Softening- and melting behavior, moistening behavior
- Viscosity curve

Suitable for analysis of coal ashes, bio ashes, slags, as well as ceramic, enamel, clay ceramics, dental ceramics, grinding discs, special ceramics, fire proof ceramics, glass, steal, soldering pastes, stainless steel and fluxing agents.

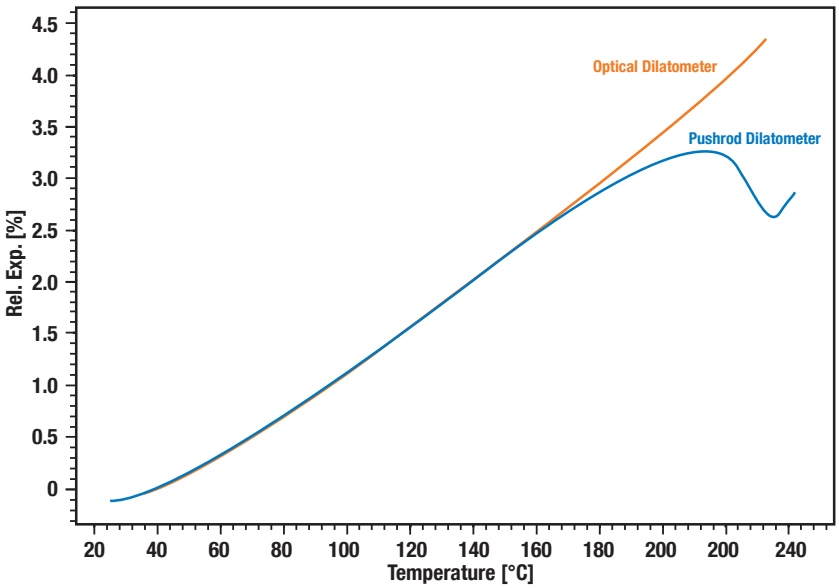
Applications

Sintering of Alumina Oxide (Al_2O_3)



Up to a temperature of 1100°C no sintering behavior can be detected at both samples. With the following slower heating rate and a dwell time of 15 min at 1600°C sample two (blue curve) shows a shrinkage of 17.11%, reflecting in a final density of 3.898 g/cm³. The initial density of the green body was 2.22 g/cm³).

Comparison



Comparison between Conventional and Optical Dilatometer when evaluating the expansion of an epoxy resin into the melting stage.

Technical Specifications

Technical Specifications

	DIL L74
Design	horizontal
Temperature range	-100…500°C, RT…500°C, RT…1000°C, RT…1400°C, RT…1600°C
Measuring system	optical non contact
Accuracy	up to 1µm
Atmosphere	oxidizing, (optional: reducing, inert, and vacuum)
Electronics	PC controlled
Interface	USB
Software	LINSEIS Optical Analysis Software

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