Thermo plus EVO2

Thermodilatometer TDL 8411

1. Introduction

Thermodilatometry is a thermal analysis technique in which a constant load is applied to a sample, and the amount of expansion and/or shrinkage of the sample is measured during heating. TDL 8411 was recently added to the lineup of the Thermo plus EVO2 series as a high-performance thermodilatometer using the horizontal differential expansion system. It is equipped with various new functions, including space-saving design, ECO mode for reducing standby power and an auto sample changer holding 24 samples.

Two types of instruments are available: a standard type with a maximum use temperature of 1100°C (the support tube and detection rod are made of SiO_2), and a high temperature type ranging up to 1500°C (the support tube and detection rod are made of Al_2O_3).

2. Features

2.1. High-sensitivity and high-accuracy measurement through differential expansion system

TDL8411 adopts the Rigaku's established reputation on differential expansion principle where the thermal expansion or shrinkage generated from the detection mechanism itself can be cancelled. It offers high accuracy and excellent reproducibility in expansion and shrinkage measurements, even with low expansion materials and samples with low-thickness.

2.2. Load setting

The load applied to a sample is set by the software. Changing the sample is easy because of the on/off in sample loading which can be done by the operating switch on the main unit.

2.3. Automatic length determination function

The sample length is automatically measured and can be recorded. It is easy to operate at continuous measurement.

2.4. Cooling after the measurement

Cooling fan unit can be automatically operated after measurement. With a cooling time within 15 minutes from 1000°C to 50°C, the system is capable of high throughput.

Fig. 1. TDL 8411 with auto sample changer.

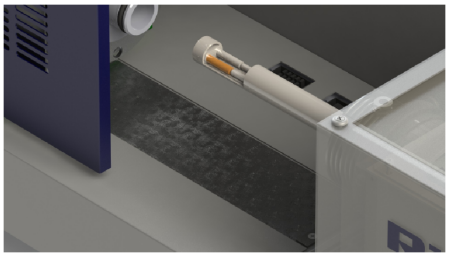
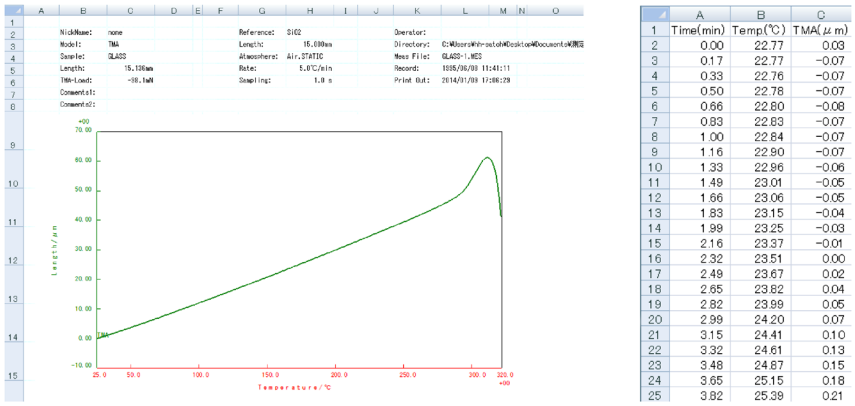


Fig. 2. Sample setting.



	A	B	C
1	Time(min)	Temp.(℃)	TMA(μm)
2	0.00	22.77	0.03
3	0.17	22.77	−0.07
4	0.33	22.76	−0.07
5	0.50	22.78	−0.07
6	0.66	22.80	−0.08
7	0.83	22.83	−0.07
8	1.00	22.84	−0.07
9	1.16	22.90	−0.07
10	1.33	22.96	−0.06
11	1.49	23.01	−0.05
12	1.66	23.06	−0.05
13	1.83	23.15	−0.04
14	1.99	23.25	−0.03
15	2.16	23.37	−0.01
16	2.32	23.51	0.00
17	2.49	23.67	0.02
18	2.65	23.82	0.04
19	2.82	23.99	0.05
20	2.99	24.20	0.07
21	3.15	24.41	0.10
22	3.32	24.61	0.13
23	3.48	24.87	0.15
24	3.65	25.15	0.18
25	3.82	25.39	0.21

Fig. 3. Example of Excel output data.

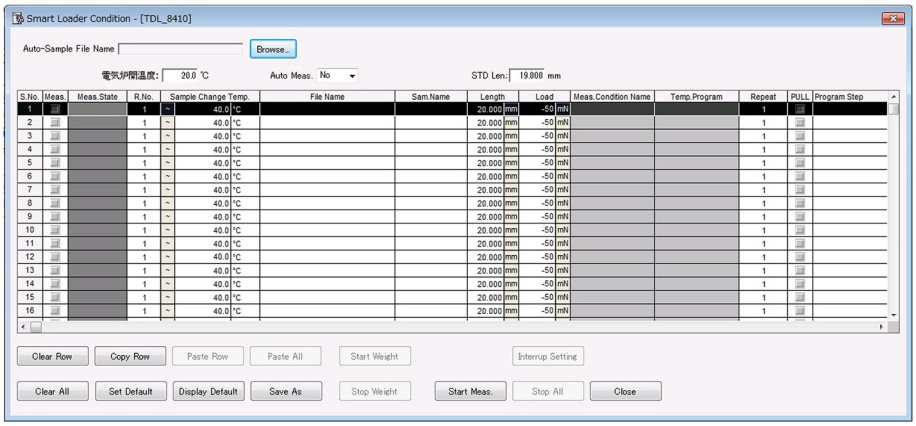


Fig. 4. Auto sample changer setting window.

2.5. ECO mode, reducing standby power

Setting to ECO mode to reduce standby power during standby state or after the completion of measurement.

In the ECO mode, the recovery time is short because the electric power for warming up is ON at minimum.

2.6. Fusion prevention function

When measuring a glass or ceramic sample in detecting shrinkage with fusion, the measurement can be stopped during heating at a temperature where specified amount of shrinkage has been attained. Thus, this makes it possible to prevent the damage of the support tube and the detection rod.

2.7. Auto sample changer

This unit can set a maximum of 24 measurement samples and 2 reference samples. The measurement can be done with a single window and, the system can perform continuous, individual and interruption measurements.

It is suitable for quality control and routine analysis flexibly.

2.8. Literature calibration software

It enables to create and register a calibration file calculated from differences in the amount of expansion at each temperature. Comparing a standard sample with a known expansion coefficient or sample measurement results will serve as a standard against literature values (reference values). Using this calibration file, it is possible to calibrate the amount of expansion in measurement results of an unknown sample, and thereby obtain more accurate measurement results.

In addition, it is possible to evaluate the accuracy and to manage the data obtained between multiple instruments.

Table 1. Specification.

	Standard model	High temperature model
Measurement temperature range	Ambient～1100℃	Ambient～1500℃
Measurement method	Compression loading method	
Detection system	Differential expansion method	
Standard sample size	ϕ5×10 mm～20 mm	
Maximum load	50 mN～300 mN	
Measurement atmosphere	Air, inert gas or gas flow	
Auto sample changer	Measurement sample 24 pieces. Standard sample 2 pieces.	

2.9. Excel and Word output

The measurement file can be directly exported to Microsoft Word or Excel. In the case of exported in Excel, numerical data is automatically created at the same time (see Fig. 3.), it is useful for data analysis and graph preparation using other application software.

2.10. Instrument usage history listing function

Various information such as data, user name, temperature program and measurement file name are saved as Excel data when a measurement is complete. This clearly indicates the usage history and operating time of instruments, and is effective for maintenance and management.

2.11. E mail function

By connecting with a LAN, it is possible to transmit information by email such as end of measurement, measurement data and occurrence of an error to PC station.

The user can confirm the status of the instrument and the on-going measurement from remote locations.

3. Conclusion

TDL 8411 is newly added to the lineup of the Thermo plus EVO2 series with compact and high-performance thermal analysis.

Together with DSC, TG-DTA and TMA, TDL can be used to evaluate the thermal property of samples in a whole range of fields such as research development and quality control.