Introduction - The Problem

• In conventional Thermal Analyzers, samples cannot be viewed directly because they are obscured by the furnace.

• So, Thermal Analyzer users are left to determine which phenomena occur by reviewing the curves obtained during the analysis.
Real-Time Sample Observation System

We tried the development of the Thermal Analysis system which could observe a sample during the measurement.

So we completed this Real-Time Sample Observation system for DSC, STA, and DMA.

Real-Time Sample Observing DSC Measurement

Sample: PET
Rate: 10°C/min
Real-Time Sample Observing DSC Measurement

Temperature (°C)

Rate: 10 °C/min

Sample: LDPE+HDPE

Copyright ©2014 Hitachi High-Tech Science Corporation All Rights Reserved.
Real-Time Sample Observing DSC Measurement

Sample: Optical Fiber  
Rate: 10°C/min

Copyright ©2014 Hitachi High-Tech Science Corporation All Rights Reserved.
Real-Time Sample Observing DSC Measurement
It is necessary to meet the following conditions to observe sample in the furnace during the measurement.
- Temperature up to 1000°C
- Temperature uniformity
- Maintain sensitivity and baseline stability
- Controlled performance of atmosphere (gas tightness and flow rate)

**Horizontal Differential Dual Beam Type STA (TG/DTA/DSC)**

**Modeling of Furnace by CAE**

**Influence on sample temperature of radiation factor**

- STA7200
  - R温度
- STA7200
  - 辐射率0.1
- STA7200
  - 辐射率0.1→0.9
- STA7200
  - 軟射率1.0
- STA7200RV
  - R温度
- STA7200RV
  - 辐射率0.1
- STA7200RV
  - 辐射率0.1→0.9
- STA7200RV
  - 軟射率1.0
Modeling of Furnace by CAE

Influence on $\Delta T/s$ of radiation factor

```
<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>STA7200 $\Delta T/s$ 輻射率0.1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STA7200 $\Delta T/s$ 輻射率0.1→0.9</td>
</tr>
<tr>
<td></td>
<td>STA7200 $\Delta T/s$ 輻射率1.0</td>
</tr>
<tr>
<td></td>
<td>STA7200RV $\Delta T/s$ 輻射率0.1</td>
</tr>
<tr>
<td></td>
<td>STA7200RV $\Delta T/s$ 輻射率0.1→0.9</td>
</tr>
<tr>
<td></td>
<td>STA7200RV $\Delta T/s$ 輻射率1.0</td>
</tr>
</tbody>
</table>
```

Computer simulation of the radiant heat
Real-Time Sample Observing STA Measurement

Sample: Paint film
Rate: 10°C/min
Gas: Air 200mL/min

Copyright ©2014 Hitachi High-Tech Science Corporation All Rights Reserved.
Sample: Glass Fiber Reinforced PP, Rate: 10°C/min, Gas: Air 200mL/min
Real-Time Sample Observing STA Measurement

Sample: Glass Fiber Reinforced PP, Rate: 10°C/min, Gas: Air 200mL/min

Copyright ©2014 Hitachi High-Tech Science Corporation All Rights Reserved.
Summary

We developed the Real-Time Sample Observation system for DSC, STA, and DMA.
Particularly, the furnace of the STA system was enabled by the measurement up to 1000°C by using the computer simulation technique.
We will thereby obtain more detailed information by this systems.

DSC System  STA System  DMA System

Thank you for your Attention