



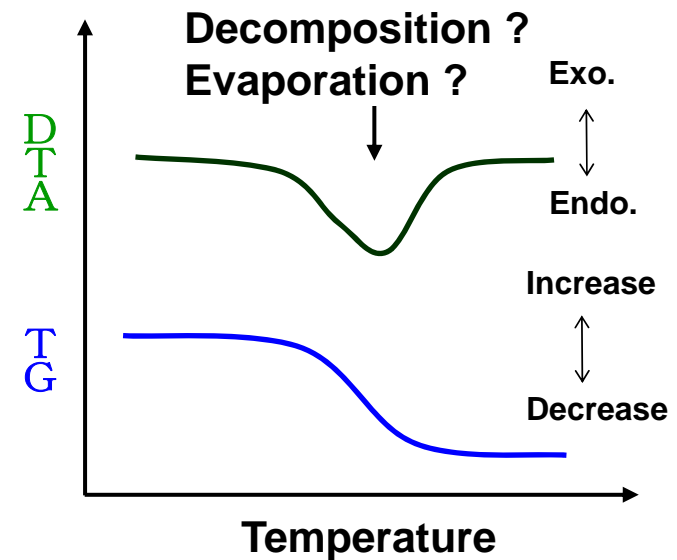
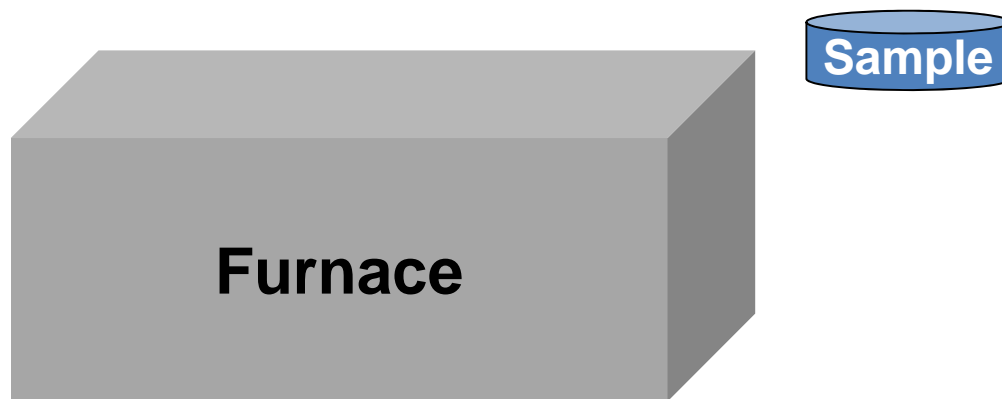
Development of a TG/DTA system with high resolution optical observation capability and its Advantages

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- In conventional TG/DTA instruments, samples cannot be viewed directly because they are obscured by the ceramic furnace, heating elements, insulation, etc.
- So, TG/DTA users are left to determine which phenomena occur by reviewing the TG and DTA curves obtained during the analysis.



- Almost all of these events could be confirmed visually
- A new TG/DTA design featuring a furnace structure that makes sample observation possible.
- The new design should provide the same quality data output as the original instrument, while also providing additional useful information about the material flow, shape change, and even unexpected events.
- This presentation highlights some examples of the optical observation TG/DTA system in action

1. Is it possible to view the inside of the furnace during measurement while maintaining:

- uniform heating
- high sensitivity
- controlled environment (gas composition / flow rate)



Ceramic furnace tube

Heating elements, insulation

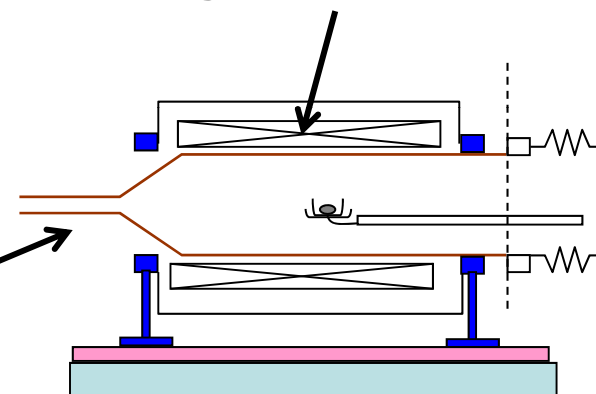


Fig.1 Structural features of a conventional horizontal TG/DTA

2. Can images be recorded in a really useful manner?

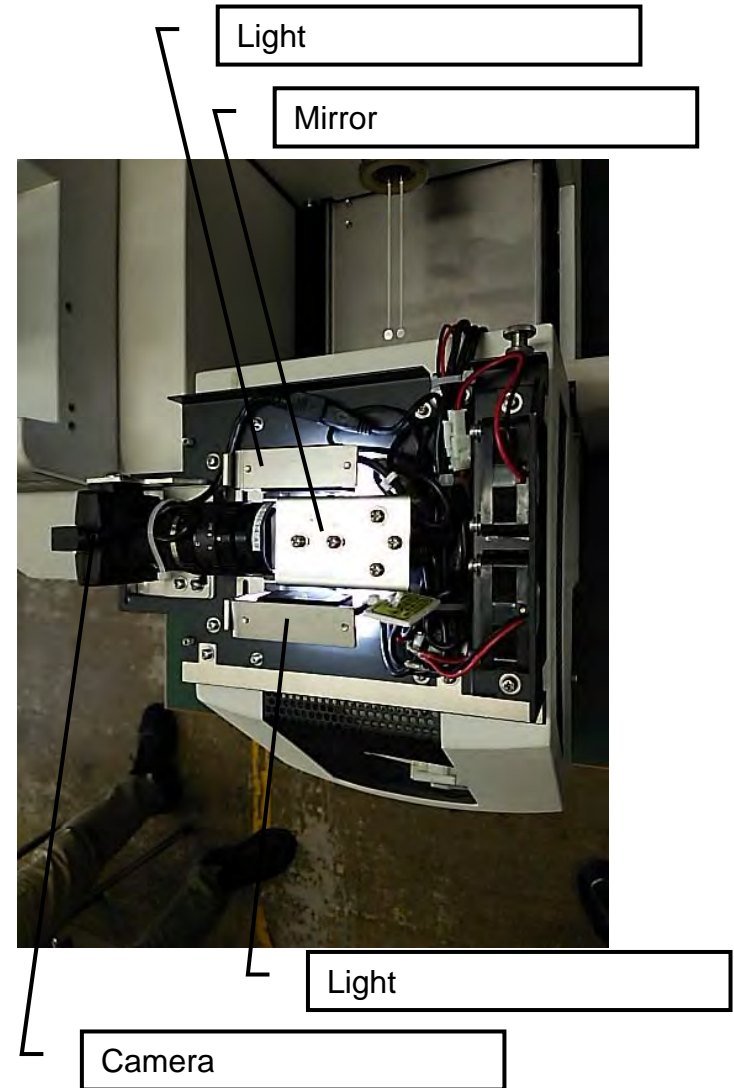
To view a sample, equipment has to be installed near the furnace, which can be challenging for a camera.

- At last NATAS, we showed thermal analyzer data linked with optical images and its advantages .
- However, currently the almost product and parts is going to be smaller than smaller, so there are need to see more detail on thermal data and also optical images.

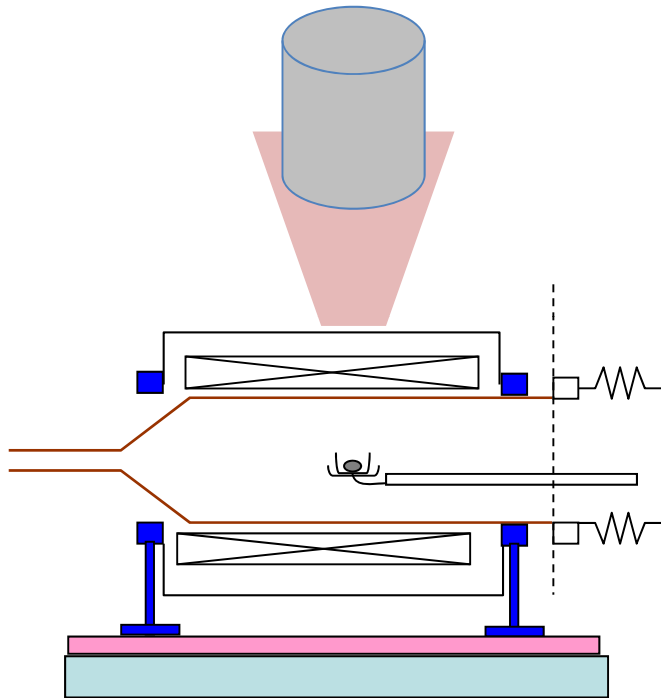
Approach for it

- Thermal Analyzer: Need high sensitivity – already done
- Optical Image: High resolution – Think about heat resistance

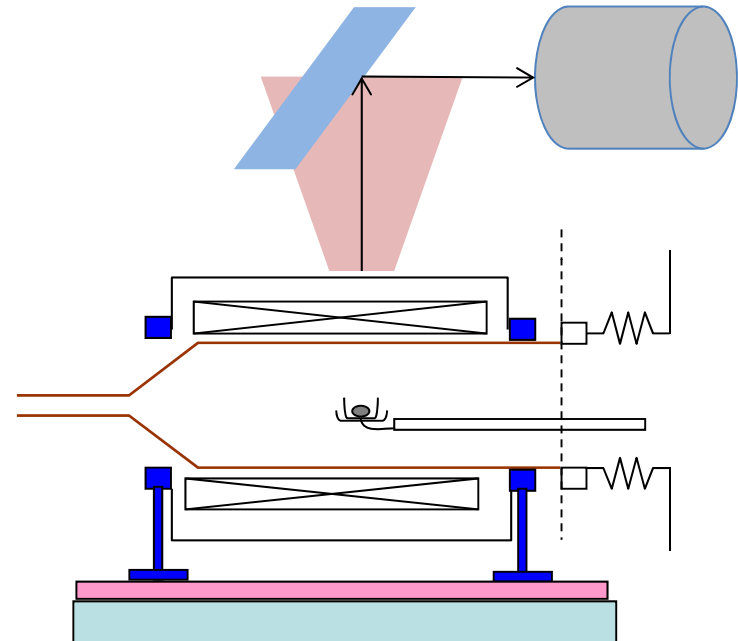
High resolutions camera mount on furnace



High resolutions camera mount on furnace



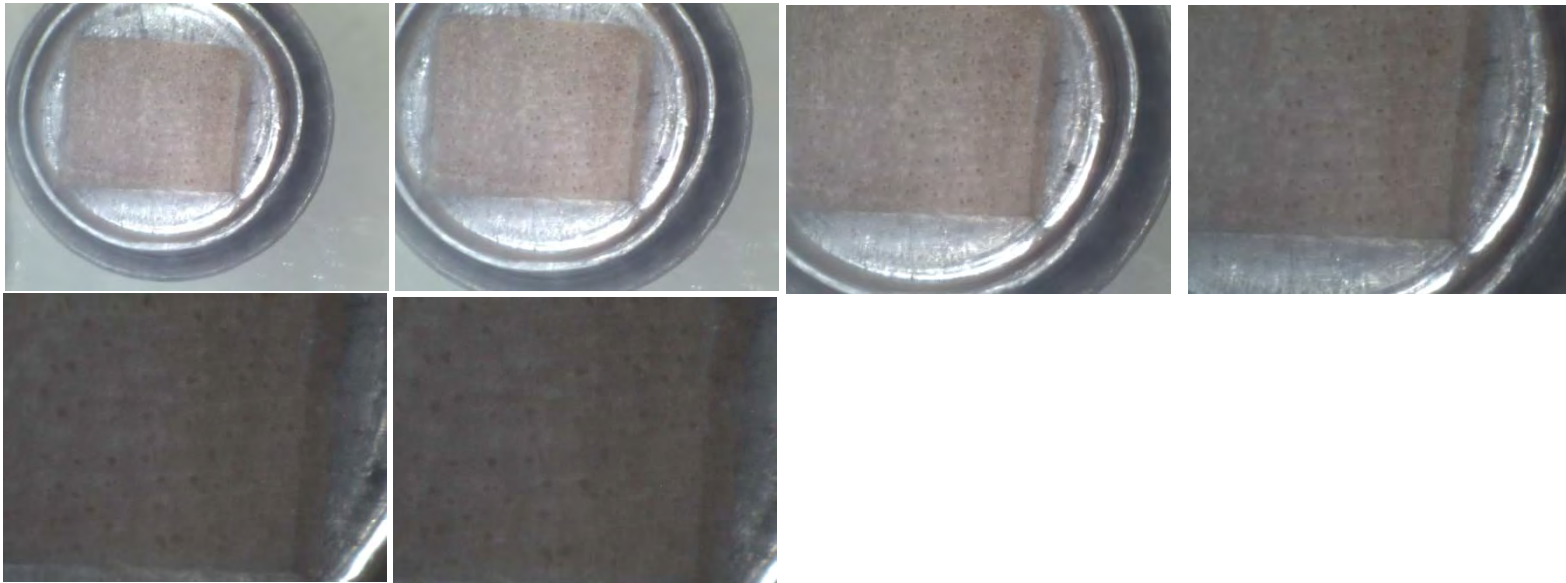
Conventional design



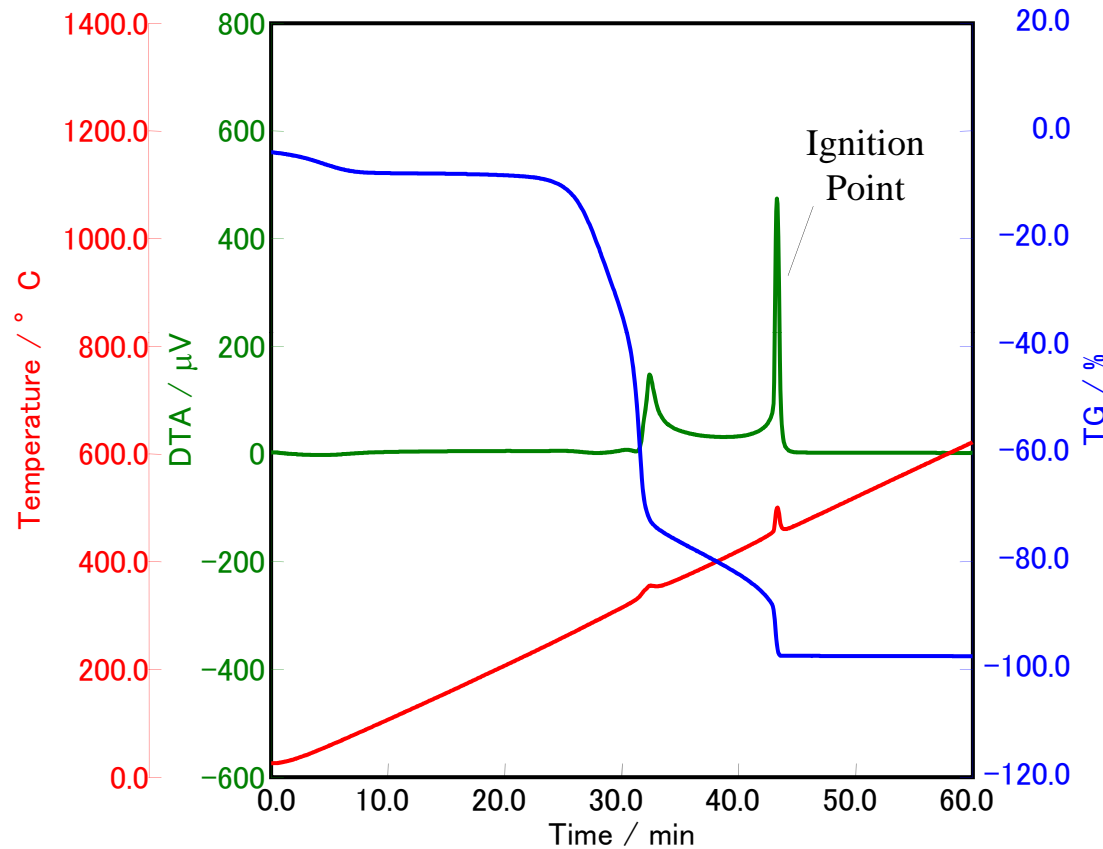
New design

Resolution Comparison on Wood material

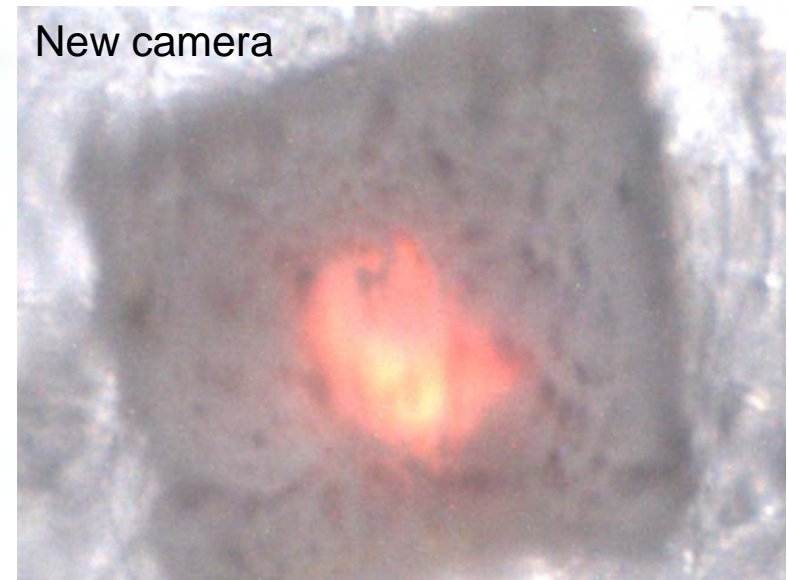
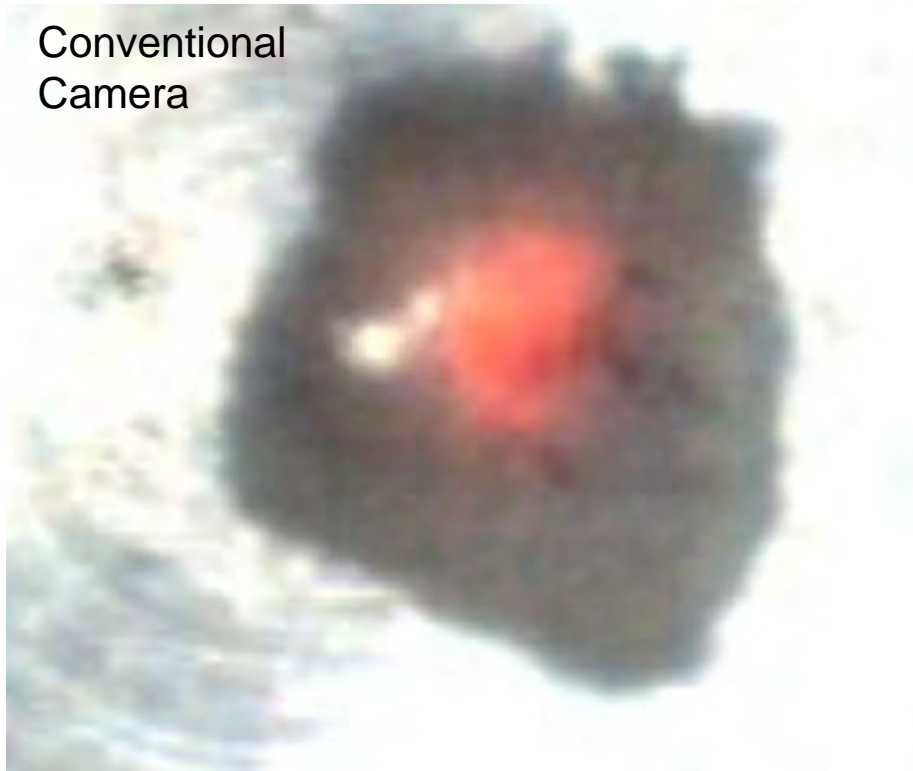
Can zoom up with digital zoom



Advantage of high resolution camera on Wood

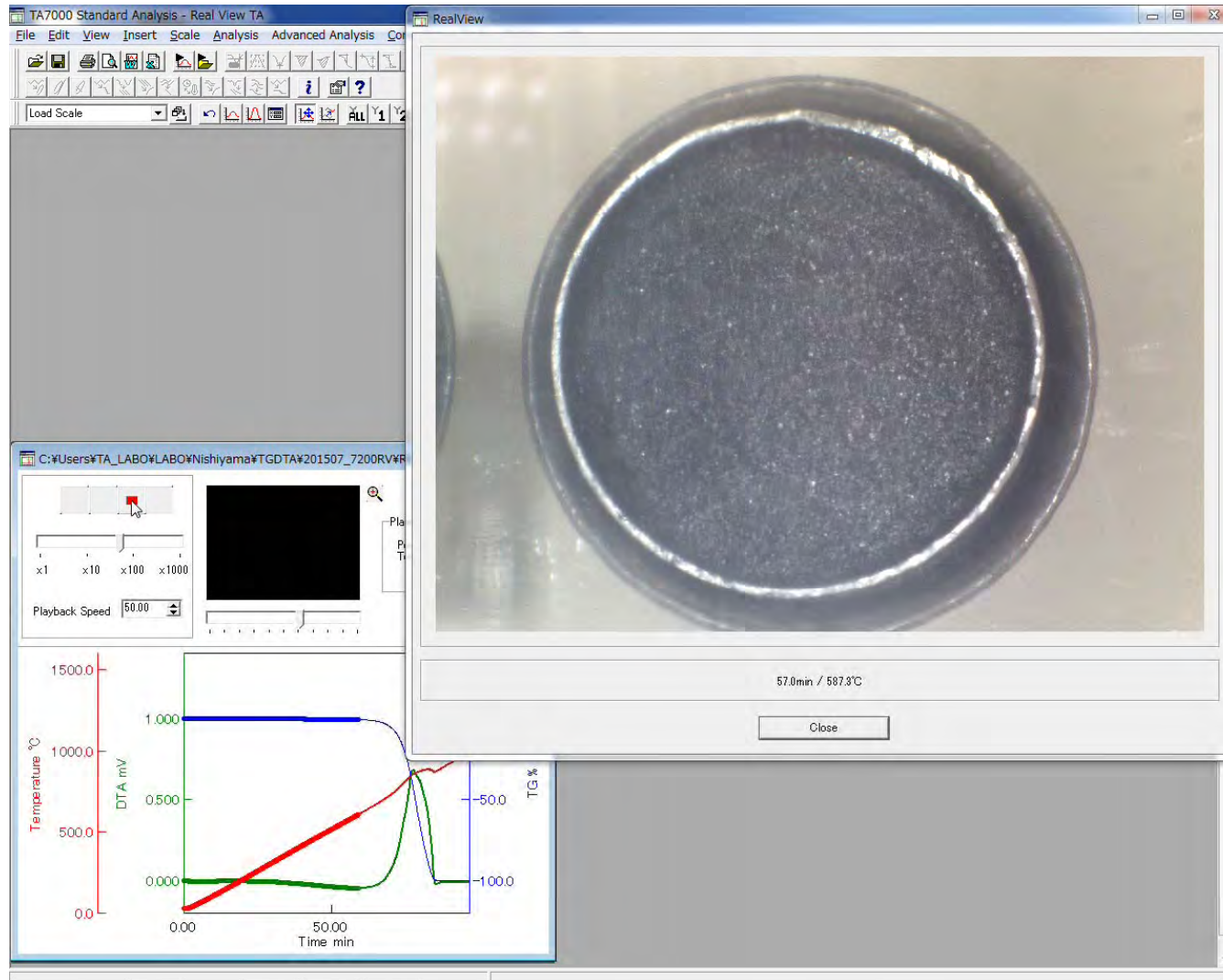


Advantage of high resolution camera on Wood

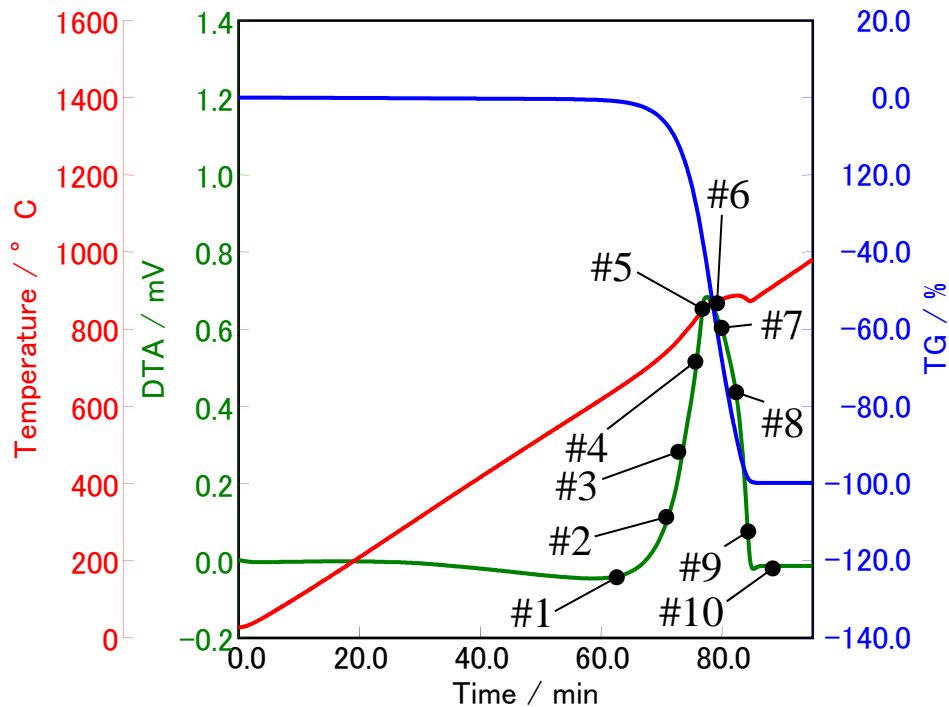


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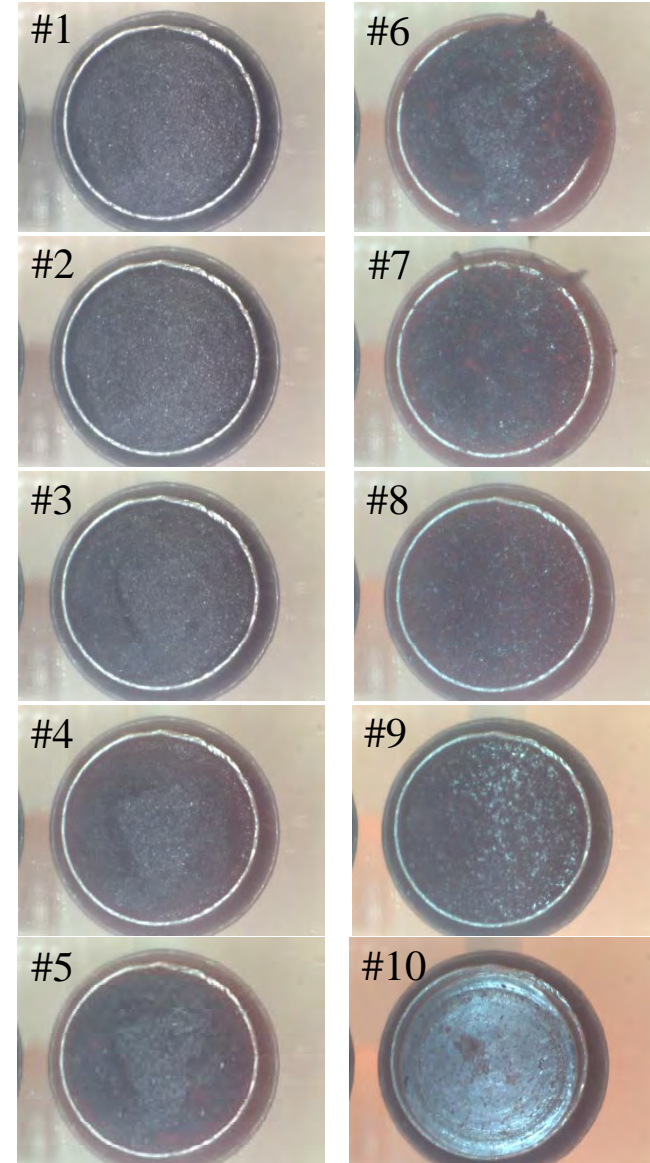
Application of milled Carbon



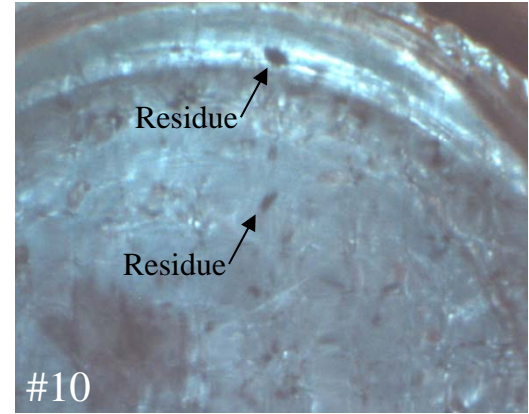
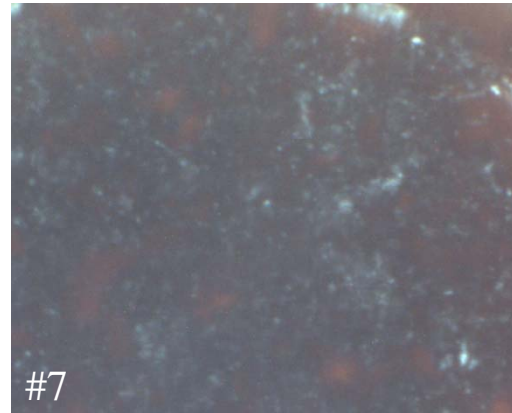
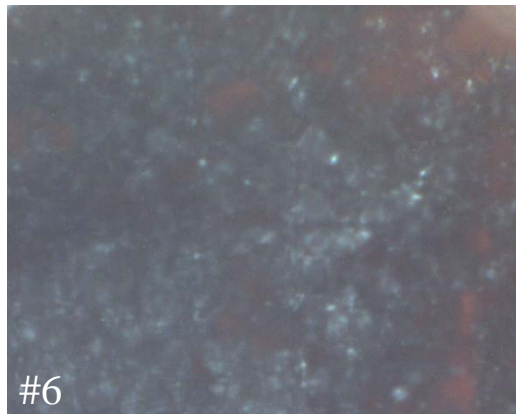
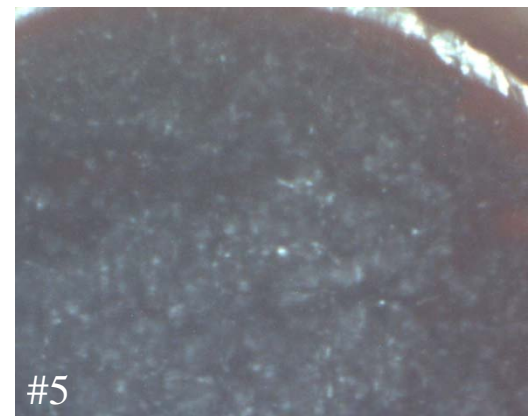
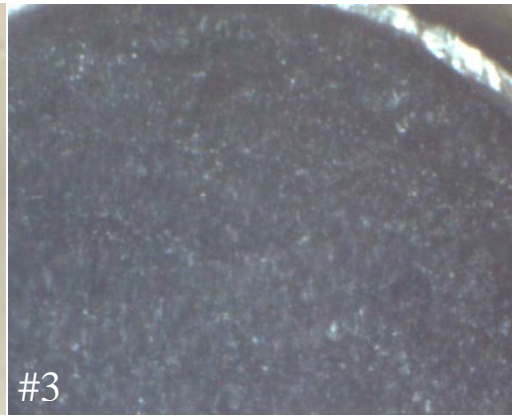
Application of milled Carbon



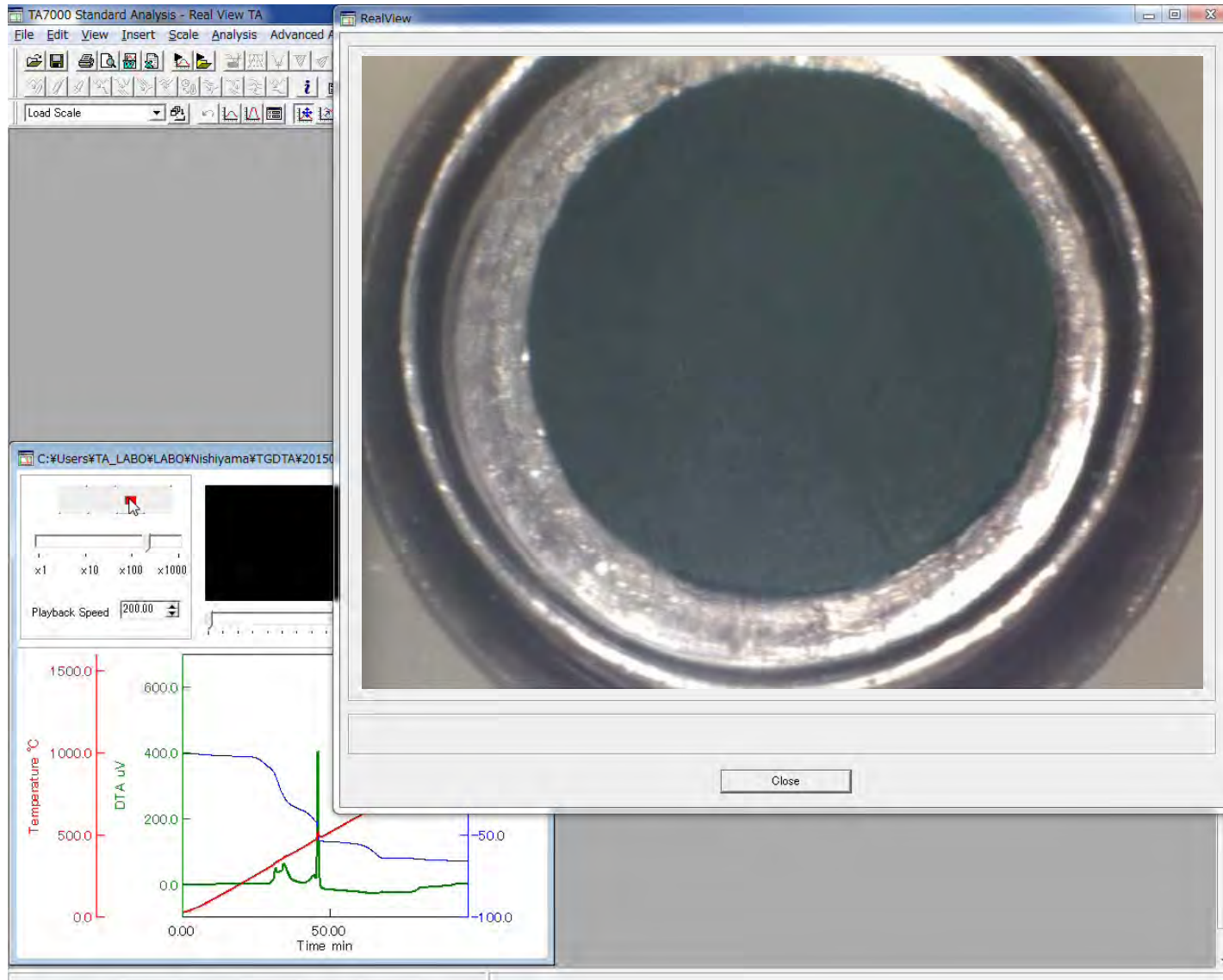
*Carbon
sample weight : 5mg
heating rate : 10°C/min
purge gas : Air 200mL/min



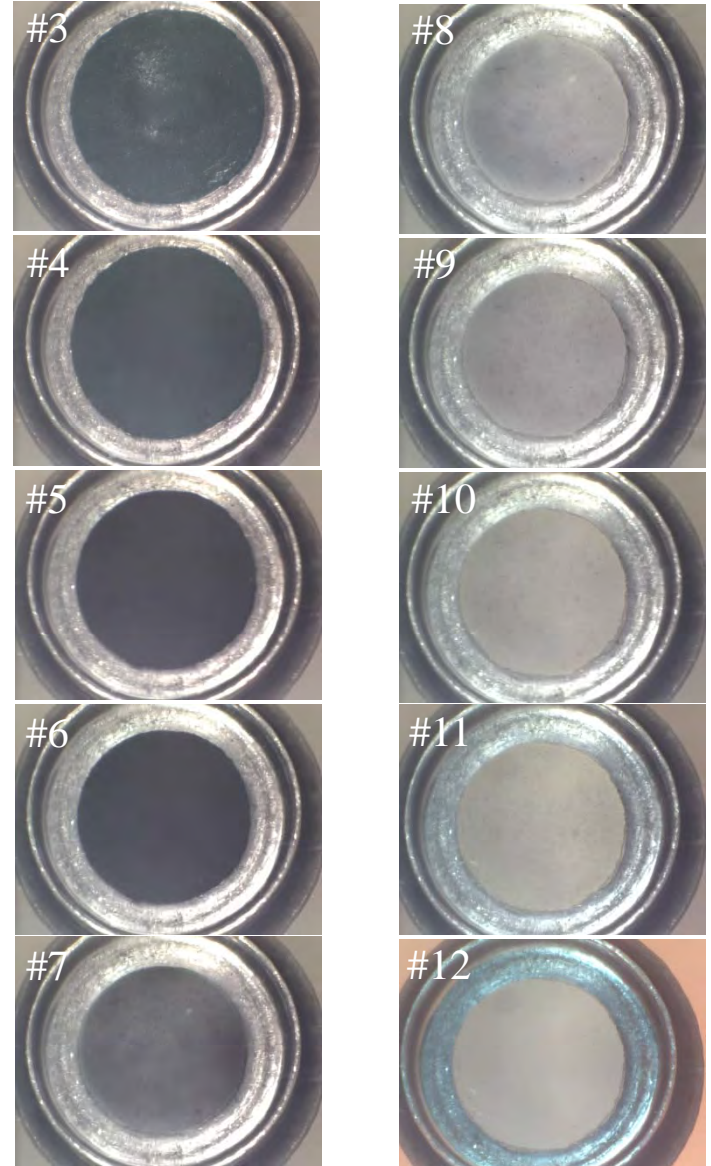
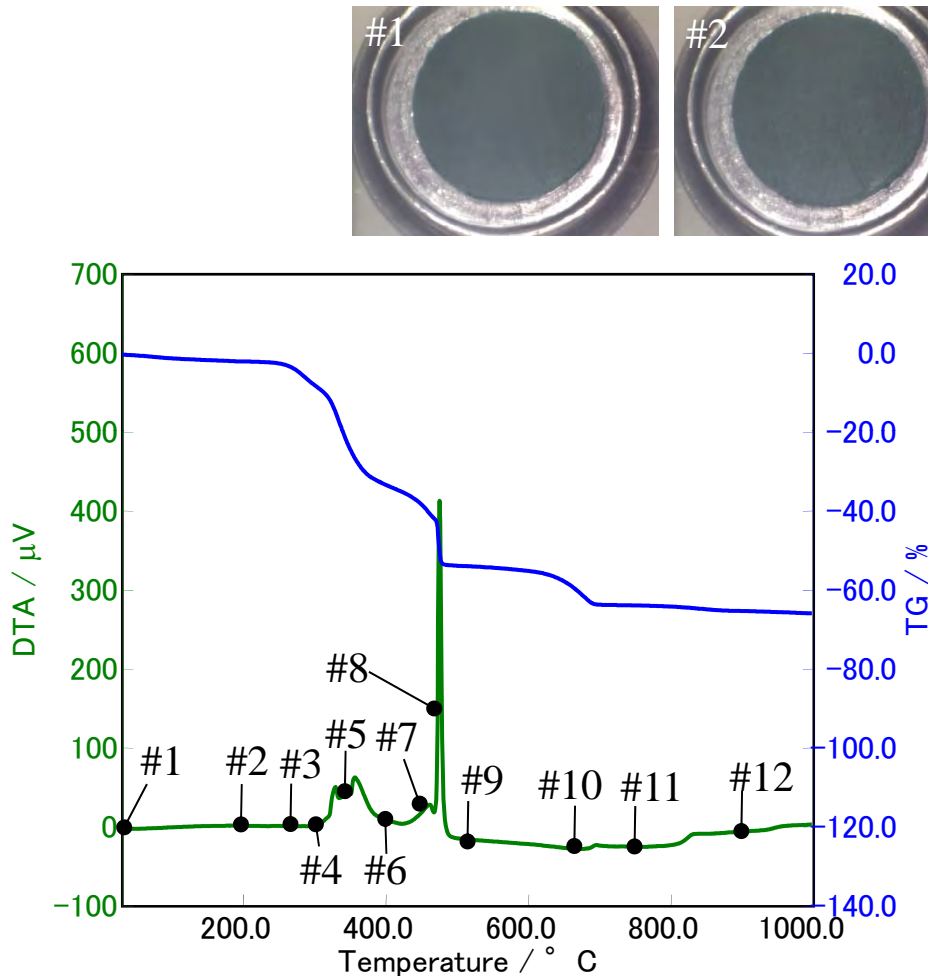
Application of milled Carbon



Application of Coating material



Application of Coating material

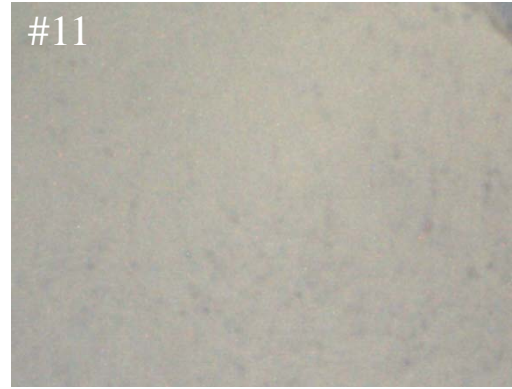
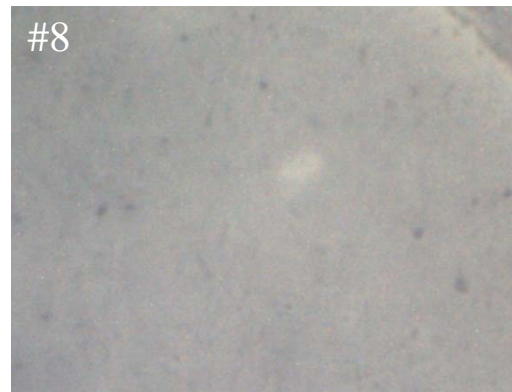


*Coating material

sample weight : 5mg

heating rate : 10°C/min

purge gas : Air 200mL/min



The black specks were in sample at #8-9. After decomposition around 600° C (#10), those were not there.

The TG/DTA with sample observation capability features:

- A quartz furnace tube and a view port
- Image recording is accomplished with a camera unit designed with heat resistance in mind.
- Software allowing overlay of each image with the corresponding data

Testing of various materials with the new TG/DTA design has demonstrated a number of benefits, including:

- Data interpretation is easier when more information is available
- More exact understanding of transitions can be gained
- Changes in physical state, such as color, that may not have an associated mass change
- Unexpected or one-of-a-kind events can be explained

END



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