

Designed exclusively for isothermal applications

# SINGLE-SHOT PYROLYZER < PY-3030 S >

High performance and high reliability

Works with a variety of sample forms

Easy operation and maintenance



FRONTIER LABORATORIES LTD.

# Single-Shot Pyrolyzer “PY-3030 S”

Pyrolysis gas chromatography (Py-GC) allows the analysis of small amounts of polymeric samples in a wide variety of forms including insoluble and composite materials without pretreatments and provides unique information that otherwise cannot be obtained. Py-GC is a very useful and powerful analytical technique for polymer characterization. Using the flash pyrolysis (Single-Shot technique), a sample is placed in a sample cup (Eco-cup), which is held initially at room temperature. The Eco-cup is then dropped into the pyrolysis furnace, which is held at a precisely set high temperature. A pyrogram is obtained by introducing the resulting pyrolyzates into a GC separation column. A number of improvements have been implemented into the Single-Shot Pyrolyzer “PY-3030 S” over the previous model, providing higher quality pyrograms.

## Features

### 1. High performance and reliability

- Reproducibility of polystyrene (PS) pyrograms is guaranteed (Fig. 1). The coefficient of variation (RSD) of peak area ratios of styrene trimer (SSS) and methyl stearate (Me-St) is guaranteed to be less than 2 % with GC/MS.
- The entire flow path is deactivated.
- Cold spots at the heat sink adapter and ITF are minimized to allow the detection of high-boiling compounds with high reproducibilities (Fig. 2).

### 2. A variety of sample forms

- Using five types of samplers including two new samplers (optional), samples in a wide variety of forms can be analyzed.

### 3. Rapid identification of unknowns

- With F-Search library search software using pyrogram and additives libraries, unknown polymeric samples can be rapidly identified.

### Reproducibility of pyrograms (Py temp: 550°C)

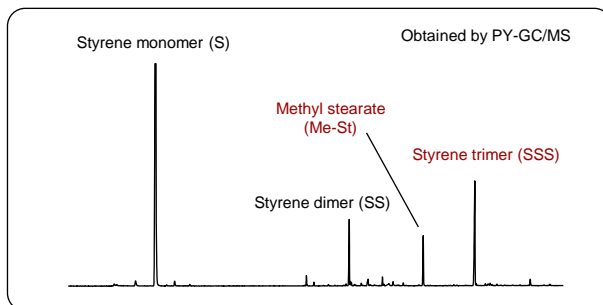


Fig. 1 Reproducibility of pyrogram

### Elutes high-boiling compounds (Py temp: 550°C)

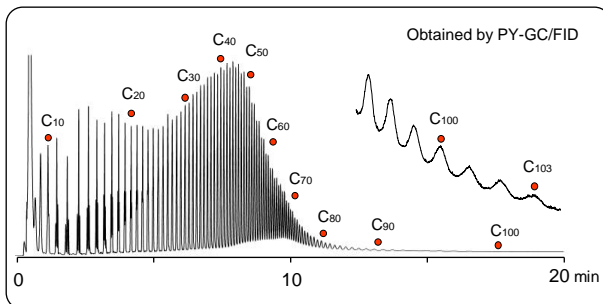


Fig. 2 Pyrogram of polyethylene

## Easy and simple sampling

Sampling is easy and simple. Manual operation is illustrated below.

4 mm

0.1 mg of sample is directly placed in a sample cup (Eco-Cup)

Attach Eco-Stick to Eco-Cup.

Fix it to a Single-Shot sampler.

Attach the sampler to Pyrolyzer and start analysis.

# Structure of "PY-3030 S"

## Selection from five samplers

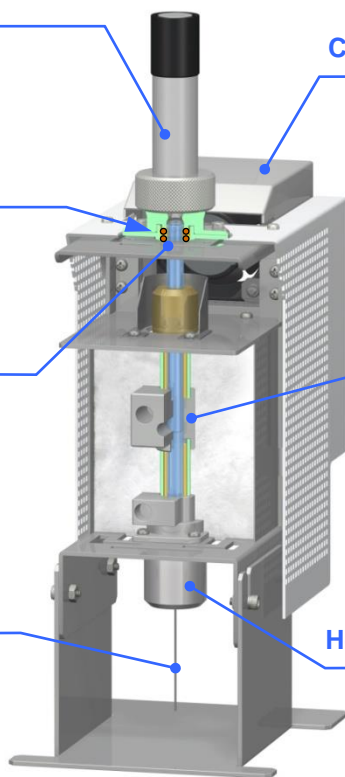
- Liquid sampler
  - Single-Shot sampler
  - On-line micro reaction sampler\*
  - Micro TD sampler\*
  - On-line micro UV sampler\*
- \*: Optional

## Improved ease of maintenance

Replacing quartz pyrolysis tubes is a simple task – just loosen the top three screws.

## Entire flow path highly deactivated

The entire flow path has been deactivated by our proprietary Ultra ALLOY® process, which helps prevent the flow path from forming active sites.



## Cooling fan to keep sample cool

Even when the furnace temperature is 800°C, the sample in the standby position is kept near ambient temperature by the cooling fan, preventing sample degradation.

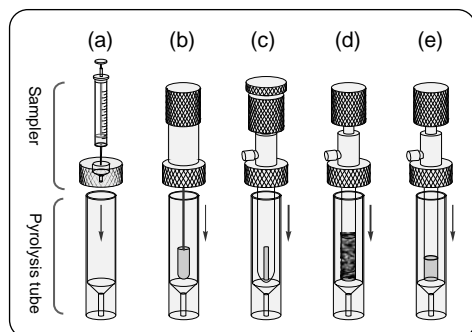
## Precise temperature control

The specially designed high performance heater and temperature controller control the furnace temperature within  $\pm 0.1^\circ\text{C}$  in the range of 40 to 800°C.

## Heat sink adapter to minimize cold spots

Combining the heat sink adapter and septum cap ensures thermal uniformity of the joints between the pyrolyzer and GC, and this enables elution of higher boiling compounds of  $\text{C}_{100}$ . (see Fig. 2)

## Five samplers



### (a) Liquid sampler (standard)

Direct liquid sample injection using a micro syringe.

### (b) Single-Shot sampler (standard)

Flash pyrolysis using sample cup (Eco-Cup)

### (c) On-line micro reaction sampler (NEW, option)

Analysis of high-pressure reaction in glass capsule

### (d) Micro TD sampler (NEW, option)

Analysis of enriched compounds with absorbent or Magic Chemisorber

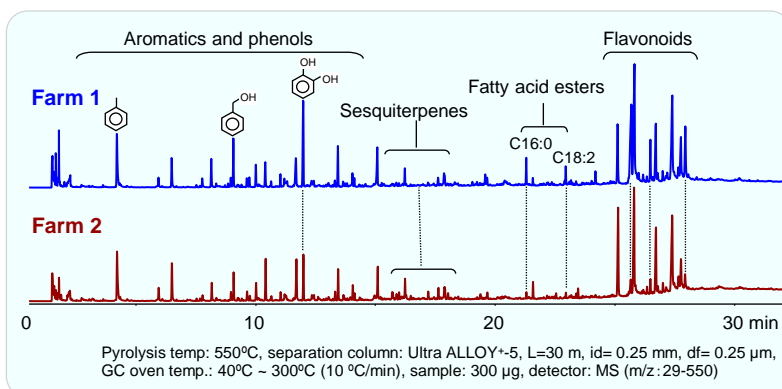
### (e) On-line micro UV sampler (option)

Analysis of photo, thermal, and oxidative degradation products by UV irradiation

## Analysis example – Pyrolysis of propolis

Composition and activity of crude drug propolis vary depending on factors such as species, collection time, production area, and individual species.

Flash pyrolysis (Py)-GC/MS technique was used to analyze propolis samples from two different production areas, and the compositions were compared.



# Collaborating with Auto-Shot Sampler for reliability and cost saving

By combining the Auto-Shot sampler with the PY-3030 S, not only can analysis be automated, but also improved data quality can be achieved. Up to 48 samples can be automatically analyzed with different analytical conditions such as varying the pyrolysis temperatures.



## 1. Great labor cost saving

### • Continuous analysis of up to 48 samples

If the average time to obtain a pyrogram is one hour, it will take one week to run 48 samples in manual operation. On the other hand, it will take just 2 full days if the Auto-Shot sampler is used. Also you can use the time to do other tasks while it is being operated automatically days and nights.

### • Each sample analyzed in varied conditions

## 2. Significantly improves reliability

### • Minimize data variation by analysts

Variations in manual sample introduction are eliminated using automation for improved data consistency.

### • Improves analytical data quality

Automation is extremely reproducible for all runs in sequence using the highly reliable Auto-Shot Sampler.

## Working with other optional accessories

Use of optional accessories such as Carrier Gas Selector (CGS-1050Ex), MicroJet Cryo-Trap (MJT-1035E), and Micro UV Irradiator (UV-1047Xe) will expand the range of applications and improve reliability. Vent-free GC/MS adapter \* will enhance GC/MS operation without venting MS vacuum in column exchange. \*: Watanabe, Anal. Sci, 27(2011) 1087-1090

## Single-Shot Pyrolyzer “PY-3030 S” specifications

<b>1. Performance guaranteed (Py-GC/MS)</b>	
■ Reproducibility of pyrogram	Reproducibility of pyrolyzates of polystyrene (PS) pyrolyzed at 550°C: ≤2 %RSD
<b>2. Furnace and sampling unit</b>	
■ Vertical micro furnace Temperature control range / stability	40 ~ 800°C (1°C step) / ±0.1°C
■ Interface (ITF) Temperature control range / stability	100 ~ 400°C (1°C step) / ±0.1°C
■ Sampler	Single-Shot sampler, liquid sampler, and other three optional samplers
■ Deactivated sample cup (max volume)	Eco-cup; F(50 µL), LF(80 µL)
<b>3. Temperature controller (PC control)</b>	
■ Overheat protection	PY: 850°C, ITF: 450°C
<b>4. Standard accessories</b>	
	Quartz pyrolysis tube, ITF needle, Ultra ALLOY® capillary column, sample cup (Eco-Cup), Eco-Stick, two samplers (see above), control software, standard sample for performance check, and others
<b>5. Others</b>	
■ Power requirement	100/120VAC or 200/240VAC, 50/60 Hz (400W max)
■ Pyrolysis furnace/temperature controller	76(W) X 143(D) X 215(H) mm/1.6 kg / 120(W) X 310(D) X 310(H) mm/ 5.4 kg
■ Other requirements	
	1. Gas chromatograph: equipped with Split/Splitless injector 2. Control PC: PC that controls GC can be used concurrently (OS: Windows 10, 8.1 with one USB communication port)

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**QUANTUM**  
ANALYTICS

✉ info@LQA.com  
☎ 281-213-5554  
🌐 LQA.com



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