

Thermal Desorption Analysis of Si Wafer Contaminants



Keywords: Thermal Desorption, OPTIC, ¼-inch Inlet, LINEX

Introduction

Organic contaminants can affect semiconductor wafer processing. The GL Sciences' Wafer Analyzer WA2560 is made to validate the wafer's cleanliness. It uses ¼-inch thermal desorption (TD) tubes to collect the organic compounds adsorbed on wafers surface. With this application, we demonstrate that our OPTIC ¼-inch Inlet Thermal Desorption system combined with a modern GCMS is very sensitive and can be used to identify the organic contaminants that are collected using the WA2560 Wafer Analyser.

Analytical conditions:

Model GCMS:	GC-2030/MS-QP2020 NX, Shimadzu Corp.
GC Multimode Inlet:	OPTIC-4S ¼-inch GC Inlet System, GL Sciences B.V.
Autosampler:	PAL3-RTC with LINEX Option, CTC Analytics AG
Column:	InertCap 5MS/Sil 0.25 mm x 30 m with 0.25 µm film
Column Temperature:	40°C(5 min) → 20°C/min → 250°C
Calibration tool:	Thermal Desorption Calibration Curve Tool, GL Sciences Inc.
Injection mode:	Expert, Split Ratio 1:49
Injection volume:	1 µL loaded onto TD tube in off-line mode
Column flow:	1 mL/min
Inlet temperature program:	40°C → 45°C/sec → 250°C
Detector temperature:	200°C (ion chamber), 250°C (interface)
Liner (TD tube):	¼-inch TD Tube packed with Tenax TA



Workflow:

The GL Sciences Thermal Desorption calibration curve creation tool has been used to load a TD tube with a sample. This off-line tool is used to inject 1µl of a mixture (0.5 ng/µl of Hexadecane (C16) and Icosane (C20)) on top of the TD tube while purging it with clean Nitrogen. After the injection, the TD tube was dried and capped on both ends with the LINEX caps. Furthermore, the capped TD tubes were placed into a Capping-De-Capping (CDC) station tray for the automated analysis using PAL3/LINEX autosampler and the OPTIC-4 ¼-inch system installed on the Shimadzu GC-2030/MS-QP2020 NX.

Results:

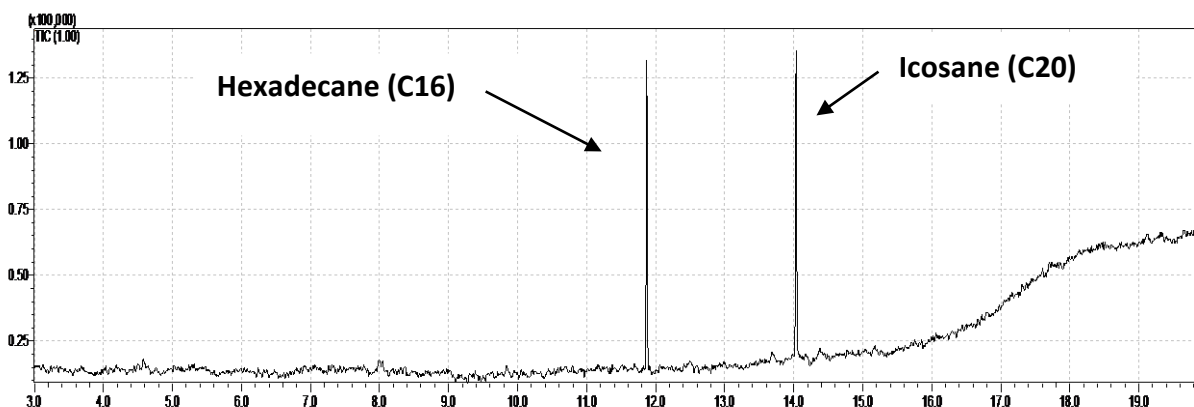


Figure 1. TIC chromatogram of thermal desorption sample - 0.5 ng/µl of C16 and C20.

Conclusions:

As it can be seen from the chromatogram above, the Tenax trapped organic compounds are detected and are very well separated. The results confirm that the OPTIC-LINEX-GC2030-QP2020NX TD system can be used for identification of these and also other organic contaminants that are often present on the wafers surface.

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