Thermo Scientific TGA-IR Module

for Nicolet FT-IR spectrometers

Procedures like failure analysis, process validation and competitive investigations often require that a sample be deformulated to identify components and to understand processing differences. The Thermo™ Scientific™ TGA-IR module along with the Thermo™ Scientific™ OMNIC™ Mercury TGA software provide the tools for this analysis.

Typical Applications

- Product Deformulation
- Causes of Product Failures
- Origins of Odors and Out-gassing

Typical Samples Types

- Rubbers, Polymers and Resins
- Adhesives
- Packaging Materials
- Pharmaceuticals
- Wood and Soils

FT-IR spectroscopy and Thermal Gravimetric Analysis (TGA) are powerful tools that are commonly used in materials characterization. The combination of these two techniques (TGA-IR) can lead to information that cannot be gained from either technique on its own. TGA measures the change in weight of a sample as a function of temperature or time. The accurate measurement of the loss of weight provides one piece of information, but it does not identify what is changing. This change in weight is usually accompanied by an evolution of gases caused by sample decomposition. FT-IR spectroscopy is used to identify these evolved gases to help determine sample characteristics.

Thermo Scientific OMNIC Series software incorporates a powerful real-time display of the total infrared response (Gram-Schmidt reconstruct). Additionally, fully processed infrared spectra are displayed so you see exactly what gases are evolving during the experiment. You may isolate specific functional groups in the evolved gases by selecting specific window reconstructs, called Chemigrams. The combination of the high-performance TGA-IR Interface and OMNIC's real-time series data collect software provides outstanding routine and research-level gas analysis. The Thermo Scientific™ Nicolet™ iS™50 FT-IR spectrometer adds the OMNIC Mercury TGA algorithm which greatly speeds and simplifies the analysis of TGA-IR data.

Thermo SCIENTIFIC

Optics and Hardware

Module

The compact, flexible design fits into the sample compartment of a Nicolet 380, Nicolet 6700/8700, Nicolet iS10 or Nicolet iS50 FT-IR spectrometer or the Auxiliary Experiment Module (AEM). The module is pre-aligned on a sample compartment base-plate for easy installation.

Cell

The 10 cm pathlength nickel-plated aluminum flow cell is designed for optimal flow characteristics and high optical throughput. The total cell volume is 22 mL consistent with typical TGA purge flows of 35 to 100 mL/min. A choice of KBr or ZnSe windows is available. The highest optical throughput and spectral range is achieved with KBr windows.

Temperature Control

Integrated digital temperature controllers provide individual control of flow cell and transfer line temperatures; selectable from ambient to 300 °C.

Transfer Line

A glass-lined stainless steel transfer line connects directly to the TGA furnace tube, providing a totally inert passage of evolved gases into the gas cell. The transfer line design eliminates cold spots that can cause samples to condense in the transfer line. The transfer line is available in a standard 5' (152 cm) or an optional 8' (244 cm) length. Tubing is 1/8" O.D. with standard compression fittings.

Detector

A DTGS detector is recommended for typical TGA-IR experiments, and provides excellent sensitivity, a spectral range of 7800–350 cm^{-1} and the best linearity for quantitative analysis; an optional MCT detector is available for high-speed evolved gas analysis.

Physical Characteristics

Power Requirements

120 V, 3 A, 60 Hz; or 240 V, 1.5 A, 50 Hz
(TGA-IR module and transfer line only)

TGA-IR Module Dimensions

10.0" W × 15.4" D × 9.3" H
(255 mm × 391 mm × 237 mm)

Weight

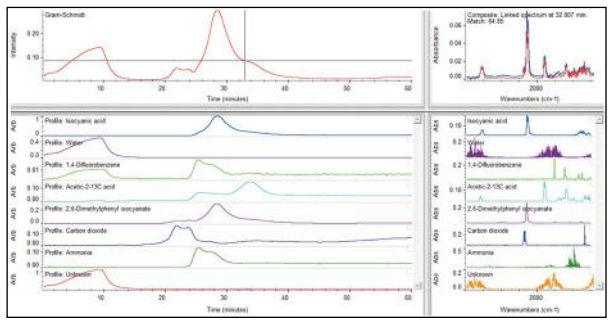
6.0 kg (13.3 lb) – module
1.8 kg (4 lb) – 5 ft line
2.9 kg (6.4 lb) – 8 ft line

TGA Compatibility

The TGA-IR module is compatible with most TGA instruments that are equipped with an Evolved Gas Option. Please contact your Thermo Scientific sales representative to check compatibility.

Regulatory approvals

Deformulation of a Polymer Resin by TGA-IR



The top left panel shows the Gram-Schmidt reconstruction indicating a material is being evolved during the thermal decomposition of the resin. The lower right panel is from the result of the Mercury TGA analysis algorithm automatically identifying the compounds present in the Gram-Schmidt reconstruction. The lower left panel displays the profiles showing which materials are being evolved at a given time.

Thermo Electron Scientific Instruments LLC, Madison, WI USA is ISO Certified.

Africa +43 1 333 50 34 0
Australia +61 3 9757 4300
Austria +43 810 282 206
Belgium +32 53 73 42 41
Canada +1 800 530 8447
China +86 21 6865 4588
Denmark +45 70 23 62 60
Europe-Other +43 1 333 50 34 0
Finland/Norway/Sweden +46 8 556 468 00
France +33 1 60 92 48 00
Germany +49 6103 408 1014
India +91 22 6742 9494
Italy +39 02 950 591
Japan +81 45 453 9100
Latin America +1 561 688 8700
Middle East +43 1 333 50 34 0
Netherlands +31 76 579 55 55
New Zealand +64 9 980 6700
Russia/CIS +43 1 333 50 34 0
Spain +34 914 845 965
Switzerland +41 61 716 77 00
UK +44 1442 233555
USA +1 800 532 4752

Thermo SCIENTIFIC
A Thermo Fisher Scientific Brand

PS52578_E 05/14M