AGILENT AEROSPACE ANALYZER

DATA SHEET

Agilent 4300 Handheld FTIR

The Agilent Aerospace Analyzer is a handheld, portable, mid-infrared Fourier transform spectrometer (FTIR) that is specifically equipped to provide high-quality, nondestructive analysis of aerospace materials including composites, polymers, coatings, and metal surfaces.

The Aerospace Analyzer provides true nondestructive molecular analysis of aircraft and aerospace materials where and when needed. The instrument package is calibrated and validated for the analysis of thermal damage on state-of-the-art composite aircraft. Additionally, the instrument can be used for a number of other applications measuring a wide variety of aerospace composites, coatings and polymers.

Thermal Damage on Composites

- Detect incipient heat damage in composites
- Precalibrated for Boeing Composites BMS 8-256 fabric, BMS 8-276 fabric and tape, BMS 8-331, and BMS 8-341
- Includes high and low check standards for each calibration.

Other Aerospace Applications

- Detect presence of release agents on surfaces (p/n 5991-5595EN)
- Evaluate plasma treatment prior to bonding (p/n 5991-4033EN)
- Nondestructively execute "first article" measurements (p/n 5991-4033EN)
- Positively identify polymers and coatings (p/n 5991-5965EN)
- Ensure that metal surfaces are free of hydrocarbon and silicone oil contamination prior to coating, bonding, and painting processes (p/n 5990-7799EN)

The Measure of Confidence

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Application Example

In the below example, the Agilent Aerospace Analyzer is used at-site, for the nondestructive analysis of thermal exposure and damage in aircraft composites.

Analysis of Thermal Damage in Composites; Application Note 5991-4037

Infrared Spectra of Composites

The carbonyl and aromatic region (1,850–1,500 cm^{-1}) of the IR spectra contains the best information to measure thermal damage of composites. Polyaromatic epoxy resins may include toughening agents such as polyether ether ketone (PEEK) or polysulfones, which all have strong absorbance features in this spectral region. The aromatic peaks diminish with increasing thermal damage (negative correlation, Figure 1), and an additional carbonyl absorbance is observed to rise with increased thermal damage (positive correlation). The broad oxidation carbonyl absorbance roughly centered at 1,722 cm^{-1} in the high thermal damage composites (Figure 1, 550 °F spectrum), is consistent with a carboxylic acid (COOH) or single conjugated ketone carbonyl group.

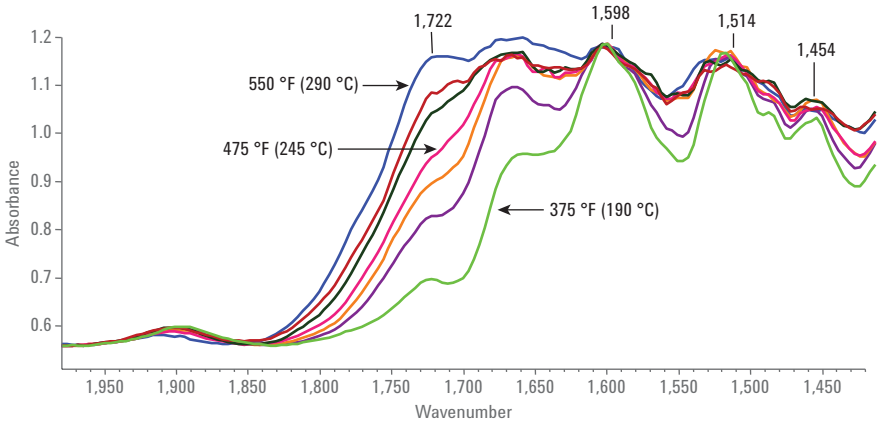

Figure 1. The IR spectra of thermally damaged epoxy composite unsanded tape measured using the Agilent 4300 MCT FTIR. The composite coupons shown were exposed at temperature steps from 375 °F–550 °F (190 °C–290 °C), 1 hour. The absorbance band at 1,722 cm^{-1} arises from the carbonyl stretch vibration associated with oxidation of the resin, and is an indicator of the overexposure of the composite to high temperatures.

The Agilent 4300 Handheld FTIR has an integrated computer running a mobile version of Microlab software. It displays measurement results, predicting the thermal exposure. Thresholds are provided to color code the result, either green for low thermal exposure or red for exposure sufficient to cause damage to the composite. Methods can contain other components that measure different aspects of the sample chemistry or provide information about the validity of the result. The thermal damage method also identifies whether hydrocarbon contamination is present (oil contamination index) and determines if the sample measurement statistically matches the calibration set (M-distance). As with the main thermal exposure component, these quality measures are assigned a critical threshold, and color coded accordingly. Figure 2 shows an example of the software output for the measurement of a damaged sample.

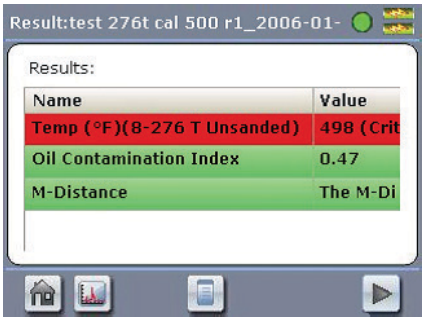

Figure 2. Agilent 4300 Handheld FTIR results screen from a measurement of a sample of Epoxy 1 tape unsanded exposed to 500 °F for 60 minutes. The result is color coded in red to show that this sample exceeds the critical threshold, indicating thermal damage.

Ordering Information and Product Specifications

Agilent Aerospace Analyzer (p/n G8186AA)
Agilent 4300 Handheld FTIR with DGTS detector
Diffuse reflectance sample interface
Specular reflectance sample interface
Diamond ATR sample interface
MicroLab software
Polymer library

www.agilent.com/chem

This information is subject to change without notice.

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