Measure and Optimize Coating System Performance

At site, non-destructive analysis of coatings using the Agilent Technologies 4300 Handheld FTIR

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The value of a handheld solution for coatings and surface analysis

Whether your company develops and manufactures coating systems, or uses coatings in their own products or applications, Agilent Technologies offers a powerful new methodology which brings value and new capabilities to testing of coatings or surfaces.

Whether the coating is designed for industrial, protective, architectural, or for specialty applications, Agilent’s new approach, based on its next generation 4300 handheld Fourier transform infrared (FTIR) analyzer, rapidly provides answers to some of the industry’s most pressing application issues.

ANSWERING SOME QUESTIONS...
WHICH COULD BE NOT ANSWERED BEFORE.
Instrument Evolution
Spectroscopy Measurements Continue to Move Directly to the Sample

Laboratory (1970's) → Laboratory (2000's) → Handheld and mobile (Current)
Introducing the 4300 Handheld FTIR
Small and powerful for on site testing
Infrared spectrum showing mix ratio of a 2 part coating

- Mix ratio critical for coating performance
  - Surface quality, hardness, durability
- Many ways for mix ratio to go wrong in manufacturing
- Non-destructive test to insure correct mix on final products.
Fast results in 4 simple steps in a few minutes

STEP 1

STEP 2

Ensure contact with sample

STEP 3

Sampling...

STEP 4

<table>
<thead>
<tr>
<th>Results:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: Damage Control</td>
</tr>
<tr>
<td>Value: 2.68</td>
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Application Area 1 – Formulation and Composition

Degree of cure: Measure the progress of cross-linking in coating systems, and the degree of completion. Confirm cure agent/resin mix ratios. Determine the relationship of time, temperature, and presence of trapped solvents on curing processes (VOC guidelines). Minimize trapped solvent in special coatings such as those in contact with foods.

Material identification: Ensure that the correct additives, fillers, resins, and cure agents are used in a coating system. Rapidly confirm, with a high degree of selectivity, that coating systems are formulated to the desired properties.

Film thickness: Determine that coatings are of the proper thickness and uniformity, as well as chemical content. Measure film thickness as a function of use to determine coating lifetime.

Coating performance as a function of formulation: Test mixture ratios of coating components and how they affect the performance of a coating—resistance to heat, water, chemicals, radiation, and so on—under actual use conditions. If you find you can use less costly ingredients without affecting performance, you will be able to produce the coating more economically.

NEW APPLICATION NOTES:
- Mix ratio identification in industrially significant 2-K coating systems using Agilent 4300 Handheld FTIR
- Positive material identification of coatings, Part 1
- Positive material MVA identification of coatings, Part 2

EXISTING APPLICATION NOTES:
- Epoxy primer thickness on aluminum measured with the handheld 4100 ExoScan FTIR http://www.chem.agilent.com/Library/applications/5990-7795EN.pdf
- Metal oxide coatings analysis using the handheld 4100 ExoScan FTIR http://www.chem.agilent.com/Library/applications/5990-7796EN.pdf
Application Area 2 – Surface Preparation and Contamination Detection

Substrate: Ensure that surfaces are clean and free of contaminants such as silicone oil or hydrocarbons, which reduce surface adhesion.

Surface activation: Ensure that surfaces are properly pretreated, as required to ensure correct coating adhesion—treating CFRP surfaces, for example, with plasma or corona to minimize release agents.

Surface preparation processes: Track the reduction in surface contaminants and optimize surface activation as a function of the process used. Develop better preparation and activation processes.

EXISTING APPLICATION NOTES:

• Detection of trace contamination on metal surfaces using the handheld 4100 ExoScan FTIR - http://www.chem.agilent.com/Library/applications/5990-7799EN.pdf

• Measure release agent on a polymer reinforced with carbon fiber - http://www.chem.agilent.com/Library/applications/5991-5595EN.pdf

• Measurement of composite surface contamination using the Agilent 4100 ExoScan FTIR with diffuse reflectance sampling interface http://www.chem.agilent.com/Library/applications/5991-0007EN_AppNote_4100_CompositeContamination.pdf

• Analysis of plasma treated carbon fiber reinforced polymer composites by FTIR http://www.chem.agilent.com/Library/applications/5991-4033EN.pdf
**Ageing:** Measure the effect of weathering, UV exposure, and general use-related changes. Test coating performance as a function of weatherometer-accelerated aging.

**Environmental factors:** Measure the effects of temperature, moisture, and all types of radiation on a coating.
At a Glance Advantages of the 4300 Handheld FTIR for coatings analysis

- Lets you measure on-site where the coating is formulated or used enabling rapid, on the spot decision making saving time and money.

- Eliminates the need for sample preparation, directly measuring individual coating constituents, formulations, and mixtures non destructively.

- Potential to speed up the R+D process by facilitating sample measurement in real situations.

- Allows for optimisation of the coating process saving time, lower rejection rates and more durable outcomes for a competitive advantage.

- Re-coating only when necessary and before physical damage occurs.

- Intuitive and simple to use Go/No go results with no scientific knowledge required.
If you would like to know more -

Please visit our website to download this presentation and access links to the application notes discussed or to be kept in the loop when we have new application notes posted!

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