ANALYTICAL ANSWERS

Fourier Transform Infrared Imaging

FTIR Imaging is a new technique that that provides wavelength specific high resolution infrared data that can be examined to determine chemical differences within a sample. By providing this type of data, chemical changes can be visualized and stand out in the sample, providing a much richer data set to solve problems in polymers, electronics, biological and material sciences.

Applications:

Materials Evaluation

Identification
- Polymers and polymer blends

Composition of heterogeneous materials
High spatial resolution applications
Drug Dissolution
Solvent diffusion studies
Protein studies

Failure Analysis

Contamination Analysis
Chemical changes in polymers at the failure site
Coating composition
Surface cleanliness
Analysis of surface degradation
Surface homogeneity

Quality Control

Process material degradation
Time-based studies
- Polymer, paints and coatings cures.

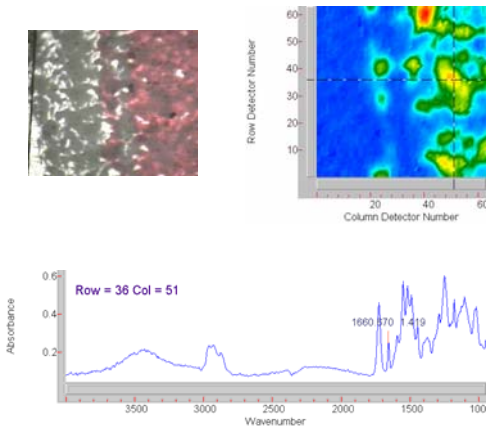
Process contamination
Optical filter performance
Optics characterization
Contaminant Identification

Principle of Operation:

A beam of infrared light is focused on the sample in either a micro or macro mode. Depending on the sample composition, differing amounts of light are absorbed at different wavelengths. This pattern of light absorption is unique for almost every organic compound and many inorganics. Using a special infrared sensitive camera a hypercube of data is collected which represents, wavelength absorbed at a position on the sample. False color images are developed from the wavelength and amount of light absorbed.

Data Output:

From the technique we can get a number of different types of data. First in many cases we get a visible image of the area of the sample we are examining. We get a data set, called hypercube, that contains all the spatial and wavelength information on the sample. We can query the data set to get a wavelength specific spatial image of the sample chemistry



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Sample Constraints:

Samples for FTIR imaging are typically liquids or solids. In a micro mode the area examined is approximately 700 microns on a side with a 5 micron spatial resolution and in the macro mode the sample can be up to 5 millimeters with a 40 micro spatial resolution. Other optical configurations with varying sample size and spatial resolution are possible.

Attenuated Total Reflectance (ATR) FTIR imaging can be used to both enhance the spatial resolution (with an inherent loss in sample size) as well as obtain IR images of surfaces that are not reflecting.