Fourier Transform Infrared Imaging

FTIR Imaging is a new technique 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.
**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.