What's New at Balazs: FTIR and RAMAN

With the acquisition of Analytical Services Group (ASG), Balazs has acquired a significant vibrational spectroscopy capability. This enhances the lab's ability to provide more complete solutions to contaminant identification and monitoring. Elemental identification of carbon containing species provided by SEM/EDS or SARIS (Laser Ablation ICP Mass Spectroscopy) is further characterized and identified using Fourier Transform Infra-Red (FTIR) spectroscopy and/or Raman Spectroscopy.

FTIR Spectroscopy

Features

- Samples are analyzed in ambient conditions
- Analysis is non-destructive and non-contact for samples
- Samples size up to 8 inches
- Quantitative technique against standards

Advantages

- Analysis can be performed on liquid materials, polymer surfaces, thin films, or films on reflective surfaces
- Technique is non-destructive to the sample which allows additional analytical techniques to be performed after FTIR
- Molecular species can be characterized on polymer or multi-layer polymer surfaces
- Analyzes areas as small as 12 µm
- Solvent extraction residues can also be analyzed by FTIR for contaminants

Benefits

- Analysis identifies organic process contaminants in a Fab, cleanroom or assembly areas i.e. assists with definition of process controls
- Results characterize specifically what type of contaminant exists and show a known amount of the contaminant
- Analysis identifies and compares polymeric materials (see spectra below)
- This method provides identification of the bonding of hydrogen in nitride films i.e. monitors poisoning of diodes

Applications

- Identification of polymer fiber (>12µm)
- Measurement of non-volatile residue (NVR) on machined metal parts
- Characterization of the changes in a polyurethane pad after CMP process
- Analysis of the surface oxidation of a polymer as compared to the bulk polymer (ATR)

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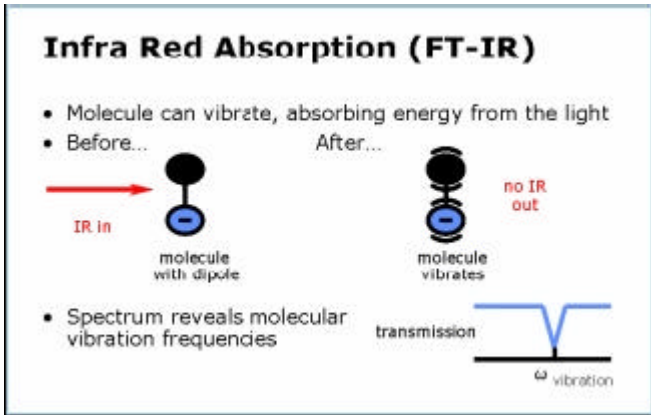
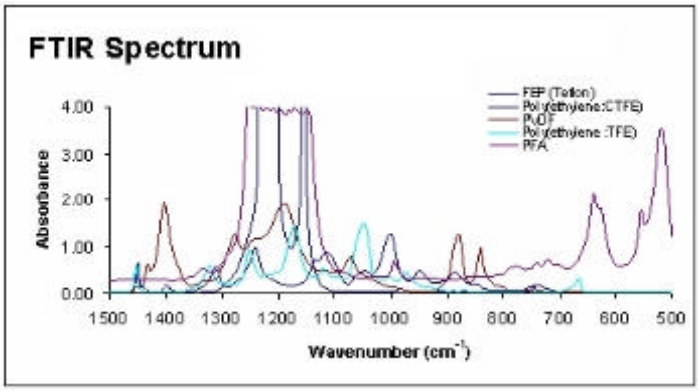
The graphic below illustrates the principles underlying infrared spectroscopy. Infrared spectroscopy utilizes the dipole moment present in a molecular bond with atoms of differing electronegativity (such as carbon to oxygen) to permit the absorption of infrared radiation. Molecules of any phase (solid, liquid, or gases) which contain bonds with strong dipole moments may be detected and characterized.



Infrared spectra provide sufficient specificity to allow the identification of individual materials with very similar elemental compositions, as is seen in the spectra below.



Raman Spectroscopy

Features

- Molecules of solid or liquid phases, which contain bonds with strong polarizability can be detected and characterized.
- Area of analysis can be as small as 1 μm
- Samples can be as large as 8 inches in diameter
- Films as thin as 50 Å can be analyzed
- Technique is quantitative against standards

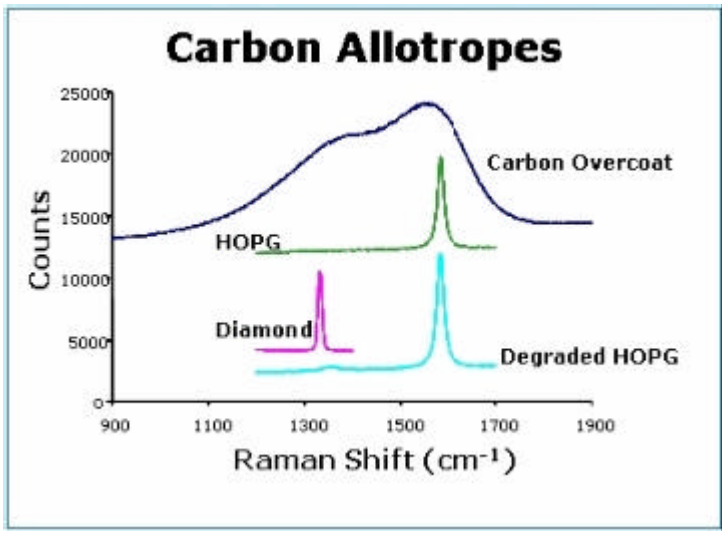
What's New at Balazs: FTIR and RAMAN

Advantages

- Analysis can be performed on liquid materials, polymer surfaces, or thin films
- This method identifies differences in crystalline structures in organic materials
- Characterizes the homogeneity of a sample surface via line scans or maps
- This technique can analyze the thickness of films
- Determines wear resistance of thin films

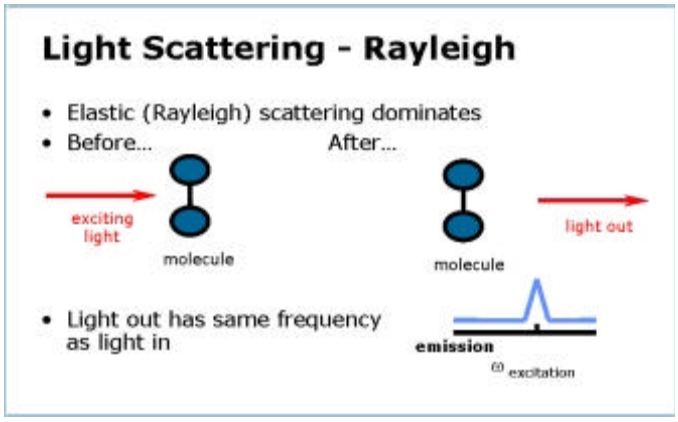
Benefits

- Raman spectra provide sufficient specificity to allow the identification of individual materials with very similar elemental compositions, as is seen in the spectra below.
- Technique is non-destructive to the sample.
- Applications
- Identification of small (1 µm) organic particles on a mask (glass substrate)
- Measurement of the amount of conversion of amorphous deposited Si to poly silicon in a RTP or laser anneal process
- Characterization of a DLC (Diamond Like Carbon) coating on a disk or head surface
- Monitoring the cure of an adhesive on the glue line of a fiber optic device



What's New at Balazs: FTIR and RAMAN

The graphic below illustrates the principles underlying Raman spectroscopy. Raman spectroscopy utilizes the polarizability present in a molecular bond with atoms of similar or identical electronegativity (such as carbon to carbon) to permit the scattering of light of a wide variety of wavelengths.



A comparison of infrared and Raman spectra collected on an identical sample illustrate the selectivity and complementary nature of the two vibrational techniques (see spectra below).