

## What does FT-IR do?

The Nexus 870 spectrometer (Thermo Nicolet) is acquired through the financial aid of National Science Foundation (Grant No.: DMR-0216899). The Nexus 870 spectrometer is equipped with a tabletop optics module (TOM) that is used for Polarization Modulation Infrared Reflection Absorption Spectroscopy. It has an extended spectral range from 25,000 to 400 $\text{cm}^{-1}$  with the resolution of 0.125 $\text{cm}^{-1}$ . The capability of Thermo Nicolet FTIR system includes:

Regular adsorption-transmission FTIR spectroscopy

Attenuated total reflection (ATR) spectroscopy

Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS)

Polarization Modulation Infrared Reflection Absorption Spectroscopy (PM-IRRAS)

Spectral wavelength range from 400 nm to 25,000 nm (Visible, NIR, and Mid-IR)

PM-IRRAS is commonly applied to monolayers and thin layers on metal substrates especially in molecular orientation and conformation in polymer films, biological and pharmaceutical application. For example, the PM-IRRAS at the air-water interface is used to investigate the interaction of peptides and proteins with lipid monolayers. Because only the proteins bound to or incorporated to the lipid monolayer are detected by IRRAS, this allows analysis of the change in the amide bands of proteins caused by the possible conformational variation upon binding. The powerful software has the following capability:

- Data collection
- Search and example library
- Spectral interpretation guide
- 2-D IR display
- TQ analysis

Infrared spectroscopy is extensively applied to various samples such as liquid, gas, and solid-state matter to identify the unknown materials. It is a sensitive technique, which can routinely detect microgram-order sample. As compared with UHV techniques such as XPS and SIMS, it is a fast easy analytical method. A routine IR measurement can be finished within about five minutes.

However, infrared spectroscopy cannot be used for analysis for the homo-nuclear diatomic molecules consisting of two identical atoms such as  $\text{O}=\text{O}$ . Also, atoms or mono-atomic ions such as helium and argon, which exist as individual atoms, cannot generate infrared spectrum. In addition, aqueous solutions are difficult to analyze with infrared spectroscopy, because water is a strong infrared absorber.