**INTRODUCTION**

Infrared spectroscopy is the study of the interactions between infrared electromagnetic energy and matter. The technique of infrared spectroscopy measures the vibrations of molecules, allowing for qualitative and quantitative measurements of samples. A Fourier transform infrared (FTIR) spectrometer is an ideal tool for the identification of unknown organic and inorganic samples whether they exist in the form of a gas, liquid or a solid.

**ELECTROMAGNETIC SPECTRUM**

Radiation in the infrared region is commonly referred to in terms of a unit called a wavenumber (ν), rather than wavelength (λ). Wavenumbers are expressed as reciprocal centimeters (cm⁻¹) and are the preferred unit as they are directly proportional to energy. A higher wavenumber corresponds to a higher energy.

\[ \nu = \frac{1}{\lambda} \]

Convert a wavenumber (ν) to a wavelength (λ) by using the following formula:

\[ \lambda = \frac{1}{\nu} \]

**COLLECTING AN FTIR SPECTRUM**

There are three quick, simple steps involved in obtaining a spectrum of a sample:

**STEP 1** Record a spectrum with no sample present. (Known as a ‘background’.)

**STEP 2** Record a second spectrum and interpret the data.

**STEP 3** Interpreting the spectra can be accomplished by comparing the spectrum to a known sample. FTIR spectroscopy is the study of the interactions between infrared electromagnetic energy and matter, allowing for qualitative and quantitative measurements of samples. A Fourier transform infrared (FTIR) spectrometer is an ideal tool for the identification of unknown organic and inorganic samples whether they exist in the form of a gas, liquid or a solid.

**INTERPRETING SPECTRA**

A portion of the electromagnetic spectrum showing the relationship of the infrared region to other types of radiation (not shown to scale). The relationship between energy, wavelength, and wavenumber is also highlighted.

**THE COMPLETE SOLUTION**

Several different accessories facilitate sample preparation and spectral acquisition, including:

- Attenuated Total Reflectance (ATR)
- Diffuse Reflectance
- Spectroscopic Reflectance
- Grazing Angle Reflectance
- Microscopy and Chemical Imaging
- ATR Chemical Imaging
  - (Micro and Macro)

**SPECTRAL RANGE COVERAGE**

Spectral range coverage for common sources, beamsplitters, and detectors. The combination of these components generates a spectrometer’s working scan range.

**A HISTORY OF COMMERCIAL ‘FIRSTS’**

- 1964
- 1983
- 2001
- 2010

**REFERENCE GUIDE**

A simplified correlation table on the right allows users to extract structural information from IR spectra. Computer-based search programs are also available for assisting in compound identification.