Gossman Forensics
A Division of ChemRight Laboratories, Inc.
103 South Main Street
Maquoketa, IA 52060
Phone: 563.652.2822
Email: dgossman@gossmanforensics.com

How does Fourier Transform Infrared (FTIR) Spectroscopy Work?

Infrared spectroscopy is the analysis of infrared light interacting with molecules. In particular, it is the measurement of the wavelength and intensity of the absorption of near-infrared light by a sample. Infrared spectroscopy is widely used by chemists to determine the functional groups in molecules. In infrared spectroscopy analysis, infrared radiation is transmitted through a sample. Some of the infrared radiation is absorbed by the sample, and some of the infrared radiation is transmitted through the sample. The resulting signal at the detector is a spectrum representing a molecular “fingerprint” of the sample. The absorption peaks correspond to the frequencies of vibrations between the bonds of the atoms making up the material. Like a human fingerprint, no two unique molecular structures produce exactly the same infrared spectrum. The term Fourier transform infrared spectroscopy originates from the fact that a Fourier transform (a mathematical process) is required to process the raw data into a spectrum so that it can be interpreted. The Fourier transform conversion, sometimes called Fast Fourier Transformation (FFT) is performed by a computer.

Fourier Transform InfraRed Spectroscopy (FTIR) is a reliable method of infrared spectroscopy and offers several analytical opportunities in academic, analytical, QA/QC, and forensic labs. Fourier Transform InfraRed technology is strongly established in everything from simple compound identification to process and regulatory monitoring and covers a wide range of chemical applications, especially for polymers and organic compounds. FTIR can provide significant amounts of information, and is used to identify an unknown material, the quality or consistency of a sample, the amount of components in a mixture.

The normal instrumental components of a Fourier Transform Infrared Spectrometer consist of a source, an interferometer, a sample compartment, a detector and a computer. The source emits infrared energy. This beam passes through an aperture which controls the amount of energy presented to the sample, and ultimately to the detector. The beam enters the interferometer in which the interference of two beams of light is employed to make precise measurements. The resulting interferogram signal exits the interferometer and enters the sample compartment. This is where specific frequencies of energy which are uniquely characteristic of the sample are absorbed. The beam passes into the detector for final measurement and the measured signal is digitized and sent to the computer where the Fourier transform takes place. The final infrared spectrum is then presented to the analyst for evaluation.