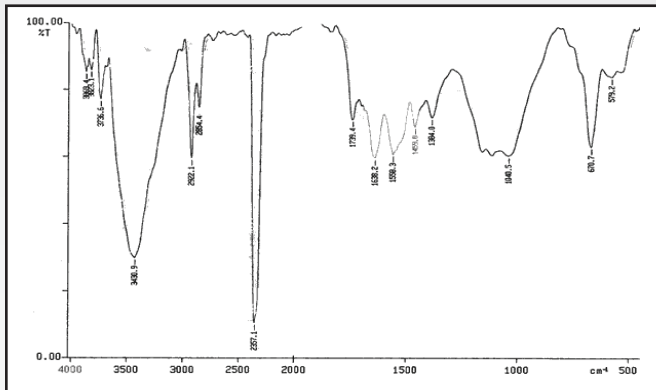


Fourier Transform Infrared Spectroscopy (FTIR)



FTIR can help you if you are involved in any of the following:

- Process Optimization - FTIR takes measurements on a continuous basis and results are reported real-time. This is particularly effective for monitoring processes with rapidly changing or variable emissions.
- Benchmarking and/or Optimizing Pollution Control Technologies.
- Engineering Emissions Evaluations - The FTIR system can detect virtually all gas-phase pollutants, including criteria pollutants, diluents, and volatile organic compounds (VOCs), and Hazardous Air Pollutants (HAPs) (*See a sample of our Spectral Library at the end of this Bulletin*).
- Determining concentrations of multiple compounds - The FTIR system can simultaneously measure multiple analytes.
- Although using this technology is not inexpensive, FTIR measurement technology can provide a distinct cost advantage since it can be used to replace several traditional methods (*cost savings can vary depending on the number of compounds present*) with the added benefit of real-time measurements.

Innovative Measurement Technology

The EPA Emission Measurement Center has been investigating applying this innovative new technology to emissions monitoring since the early 1990's:

"FTIR technology shows promise since it has the capability to measure more than 100 of the 189 Hazardous Air Pollutants (HAPs) listed in Title III of the Clean Air Act Amendments of 1990 (CAAA). Upon passage of the CAAA, measurement methods existed for only 40 of the HAPs. The FTIR has the capability of measuring multiple compounds simultaneously, thus providing an advantage over current measurement methods which measure only one or several HAPs."

FTIR Methods:

- EPA Method 318 - Extractive FTIR Method for Measurement of Emissions from Mineral Wool and Wool Fiberglass Industries
- EPA Performance Specification 15 for Extractive FTIR CEMS in Stationary Sources
- EPA Method 320 - Vapor Phase Organic and Inorganic Emissions by FTIR (*extractive*)
- EPA Method 321 - Determination of HCl for Portland Cement Industries
- EPA Protocol for Extractive FTIR for Analysis of Gas Emissions
- NIOSH Method 3800 - Organic and Inorganic gases by Extractive FTIR Spectrometry

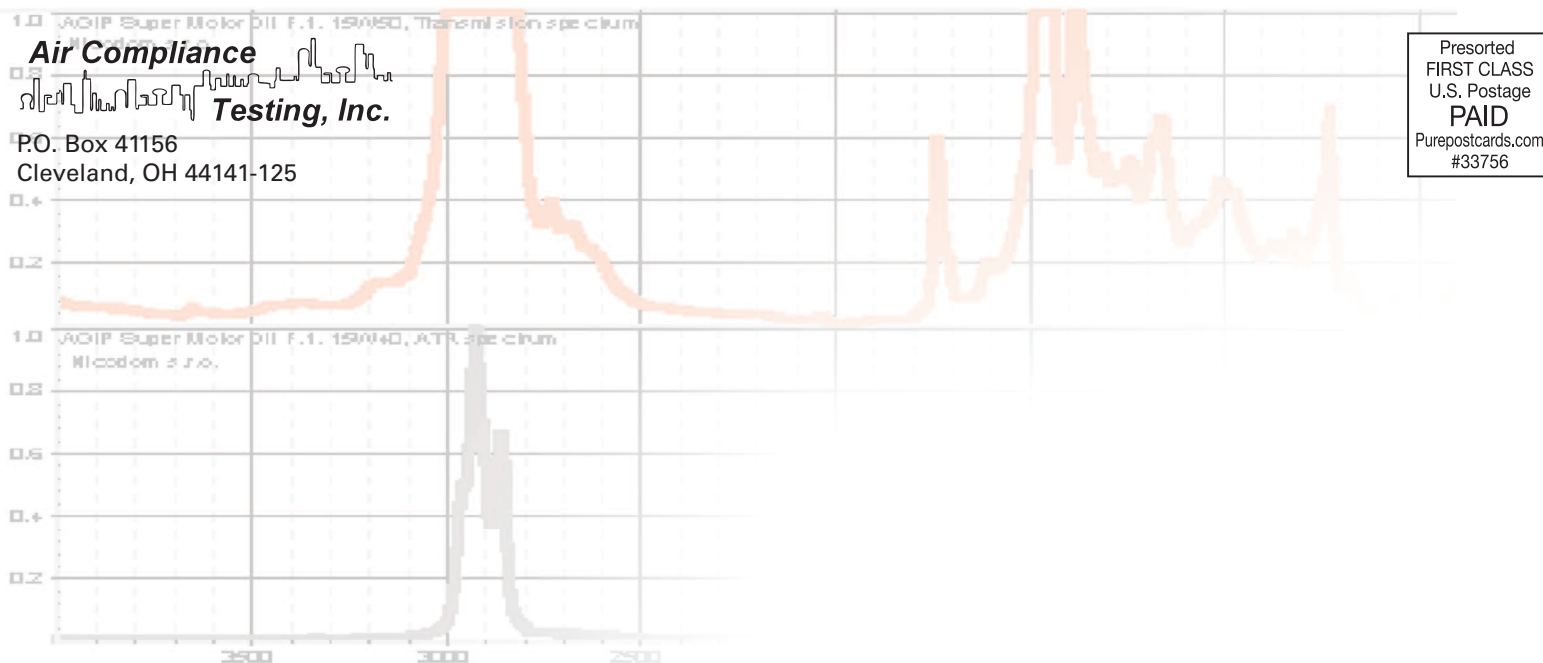
FTIR Benefits:

- Real-time measurement results.
- Simultaneous analysis of multiple gaseous compounds.
- Measures a wide variety of volatile compounds (*Inorganic and Organic*).
- Sensitivity from very low parts per million to high percent levels.
- Provides a precise measurement method which requires no rigorous external calibration.
- Speed. Measurements take only seconds.

Principle of Operation

Because chemical bonds absorb infrared energy at specific frequencies (*or wavelengths*), the basic structure of compounds can be determined by the spectral locations of their Infra Red (IR) absorptions. The plot of a compound's IR transmission vs. frequency is its "fingerprint", which when compared to reference spectra identifies the material.

FTIR offers speed and sensitivity impossible to achieve with earlier wavelength-dispersive instruments. This capability allows rapid analysis of micro-samples down to the nanogram level in some cases, making the FTIR unmatched as a problem-solving tool in organic analysis.



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A Sample List of Compounds from our Spectral Library

Acetaldehyde	Acetonitrile	Acetophenone	Acrolein	Acrylonitrile	Allyl Chloride
Aniline	Benzene	Benzotrifluoride	Benzyl chloride	Bis(chloromethyl) Ether	Bromoform
1, 3-Butadiene	Carbon Disulfide	Carbonyl Sulfide	Chloroacetic Acid	Carbon Tetrachloride	Chloroform
Chlorobenzene	Chloroprene	o-Cresol	m-Cresol	p-Cresol	Cumene
Dichloroethyl ether	Dichlorovos	n, n-Diethyl Aniline	Dimethyl Formamide	1, 1-Dimethyl Hydrazine	1, 4-Dichlorobenzene
Dimethyl phthalate	1, 4-Dioxane	Epichlorohydrin	1, 3-Dichloropropene	1, 2-Epoxybutane	Ethyl Acrylate
Ethyl benzene	Ethyl chloride	Ethylene Dibromide	Ethylene Dichloride	Ethylene Oxide	Ethidene dichloride
Formaldehyde	Hexachloroethane	Hexane	Hexachlorobutadiene	Hydrogen Chloride	Isophorone
Maleic anhydride	Methanol	Methyl Bromide	Methyl Chloride	Methyl Chloroform	Methyl Ethyl Ketone
Methyl hydrazine	Methyl iodide	Naphthalene	Methyl Isobutyl Ketone	Nitrobenzene	Methylene Chloride
2-Nitropropane	Phenol	b-Propiolactone	Methyl Methacrylate	Methyl Tert Butyl Ether	Propylene Dichloride
Propionaldehyde	Propylene Oxide	Quinoline	Styrene	n-Nitro Sodimethylamine	n-Nitrosomorpholine
1, 2-Propylenimine	Styrene Oxide	Toluene	Tetrachloroethane	o-Toluidine	Trichloroethylene
o-Xylene	Triethylamine	m-Xylene	Vinyl Acetate	2, 4-Toluene Diisocyaate	1, 2, 4-Trichlorobenzene
p-Xylene	Vinyl Bromide	Vinyl Chloride	Carbon Dioxide	1, 1, 2-Trichloroethane	2, 4, 5-Trichlorophenol
Ammonia	Vinylidene Chloride	Acetone	Ethane	2, 4, 6-Trichlorophenol	2, 2, 4-Trimethylpentane
Methane	Carbon Monoxide	Sulfur Dioxide	Ethylene	Acrylic Acid	

