

SERIES 100 FT-IR EMISSION/TRANSMISSION SPECTROMETER

The Series 100 is currently not being built for sale. Advanced Fuel Research, Inc. does offer an emissometry testing service - please see information on the **Series 205 Spectral Emissometer**.

The Series 100 performs on-line and in-situ monitoring of combustion devices including:

- gas composition and concentrations
- gas temperature
- soot concentration and temperature
- particle size, composition, and temperature
- emission and transmission tomography

The system performs simultaneous Fourier Transform Infrared (FT-IR) emission and transmission spectroscopy. Tomographic reconstruction of spectra from multiple lines-of-sight can be used to obtain spatially resolved spectra. The spectra are analyzed using automated routines which match observed spectra with library spectra. Measurements of gas concentrations are based on the absorption of radiation transmitted through the sample. Temperatures are obtained from a combination of emission and absorption. Particle size is obtained by examination of the wavelength dependent scattering of radiation by diffraction. These measurements are described in several publications (see below). Several of these measurement methods have been successfully employed in commercial industrial plants under harsh conditions. Recent improvements include the use of Hadamard signal encodement of the tomographic data to increase the signal-to-noise (S/N) ratio and simplify the tomographic apparatus.

1. Markham, J.R., Zhang, Y.P., Carangelo, R.M., and Solomon, P.R., "FT-IR Emission/Transmission Tomography of a Coal Flame," 23rd Symposium (Int) on Combustion, The Combustion Institute, Orleans, France, pp 1869-1875, (1990).
2. Best, P.E., Chien, P.L., Carangelo, R.M., Solomon, P.R., Danchak, M., and Ilovici, I., "Tomographic Reconstruction of FT-IR Emission and Transmission Spectra in a Sooting Laminar Diffusion Flame: Species Concentrations and Temperatures," Combustion and Flame, 85, 309-318, (1991).

3. Morrison, P.W., Jr., Cosgrove, J.E., Carangelo, R.M., Carangelo, M.D. and Solomon, P.R., "Fourier Transform Infrared (FT-IR) Instrumentation for Monitoring Recovery Boilers," Tappi Journal, 74, (12) 68, (1991).
4. Bates, S.C., Carangelo, R., Knight, K., and Serio, M.A., "Fourier Transform Infrared Hadamard Tomography of Sooting Flames," American Institute of Physics, Rev. Sci. Instrum. 64 (5) May 1993.

SYSTEM SPECIFICATIONS

SPECTROMETER HARDWARE:

Bomem MB 100:

Permanently aligned
Operates in any orientation
Spectral Range: 350 to 6000 cm^{-1}
Resolution: 1 - 128 cm^{-1}

Modifications: Simultaneous Acquisition of Emission and Transmission (E/T) or Emission and Reflection (E/R) Spectra

Detectors: Linearized MCT (Liquid Nitrogen or TE Cooled), DTGS
GPIB Interface Hardware

SAMPLING OPTICS:

Custom Sample Interface Optics

SOFTWARE:

On-Line **VISTA** Process FT-IR Operating System
E/T and E/R Software for Analysis of Temperatures and Compositions
Conventional and Hadamard Tomography Software for Spatially Resolved Spectra
Particle Size Analysis Software

MEASUREMENTS:

Temperatures: 50 to 3000°C \pm 10°C
Composition: Most Heteroatomic Molecules and Soot
Particle Size: Submicron to 60 microns