

Cryostats for FTIR Spectroscopy

Fourier Transform Infra-Red (FTIR) spectroscopy is often used to characterize the structure and temperature dependent performance of materials including liquids, solids, gases, and thin films. In the simplest FTIR spectrometer arrangement, a sample is located in the beampath before the detector. Two spectra are obtained for each measurement, (a reference spectrum with no sample in the beampath, and a second spectrum with sample installed). The ratio of these two spectra produce the measurement used by the researcher.

Introduction of a cryostat for sample cooling adds a degree of complication to the procedure. The reference spectrum must now be taken with the cryostat installed in the beampath (to incorporate the cryostat optics into the reference measurement). In most cases, the cryostat is then removed from the spectrometer for sample installation and reinstalled to make the actual sample measurement. The process of cryostat removal, sample mounting, and cryostat reinstallation can require from thirty to sixty minutes, limiting the quantity of samples that can be characterized per day. In addition, the cryostat must be reinstalled in the identical position on the spectrometer for each subsequent sample measurement. If the cryostat position changes, the reference measurement will no longer be valid due to small variations in the cryostat optical path.

The Janis Research range of cryostats for FTIR address these limitations while providing a sample environment that is best suited for your application. Options for FTIR spectroscopy include:

- Multiple sample mounting provisions, allowing the user to switch between a reference path and several samples without moving the cryostat.
- Precision linear and rotary manipulators, manually controlled.
- Precision linear and rotary manipulators, remotely controlled.
- Sample in vacuum, or sample in dynamic or static exchange gas.
- Liquid helium, liquid nitrogen or closed cycle refrigerator cooling.
- Mounting flange to fit many commercially available spectrometers.
- IR windows, including ZnSe, polyethylene, polypropylene, sapphire, diamond and more.
- Windows are available wedged for reduced interference, or plane parallel.
- High temperature operation (ST-100-FTIR, VPF-100-FTIR and PT-950-FTIR with sample in vacuum)

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Cryostats for FTIR Spectroscopy



ST-100-FTIR



STVP-100-FTIR

The SuperTran and SuperTran-VP systems for FTIR include a high-efficiency transfer line for low cryogen consumption, and feature additional spacers for minimal vibration. Our pulse tube system for FTIR features very low vibrations - particularly on the room temperature housing – allowing the cryostat to be mounted directly on the spectrometer. The flexibility of Janis' design and the range of options available, combined with a reputation for quality, make the Janis FTIR cryostats the ideal choice for efficient and high quality FTIR measurements.

Existing designs include:

1. Continuous flow cryostat with sample in vacuum – ST-100-FTIR
2. Continuous flow cryostat with sample in vapor – STVP-100-FTIR
3. Liquid nitrogen pourfill cryostat - VPF-100-FTIR
4. Low vibration pulse tube - PT-950-FTIR
5. Helium-3 system with standard sample loading, sample in vacuum - HE-3-SOSV-S

As with all Janis cryostats these designs may be modified to suit your individual requirements. Contact Janis today to discuss how an FTIR cryostat may be integrated with your spectrometer system.

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| System Specifications | ST-100-FTIR | STVP-100-FTIR | VPF-100-FTIR | PT-950-FTIR | HE-3-SOSV-S |
|---|---|--------------------------------------|---|---|--------------------------------|
| Sample Environment | Vacuum | Liquid or flowing vapor | Vacuum | Exchange gas | Vacuum |
| Temperature Range | ~2.5 – 325 K (higher temperatures optional) | <2 – 300 K | 65 – 325 K (higher temperatures optional) | <7 – 300 K (higher temperatures optional) | 0.35 – 300 K |
| Initial Cooldown Time | 15 minutes | 15 minutes | 15 minutes | N/A | ~ 12 hours |
| Temperature Stability (with controller) | 50 mK or less | 50 mK or less | 50 mK or less | 50 mK or less | +/- 3.0 mK |
| Orientation | Any position | Vertical for <4.5 K | Vertical | Vertical | Vertical |
| System Weight | Approx. 10 lbs. (less transfer line) | Approx. 15 lbs. (less transfer line) | Approx. 10 lbs. | Approx. 70 lbs. not including compressor | Approx. 90 lbs. |
| Cryogen Consumption (cooldown) | 0.4 liters LHe from 325 – 4.2 K | 0.5 liters LHe from 325 – 4.2 K | N/A | N/A | 30 liters LHe from 325 – 4.2 K |
| Cryogen Consumption (operation) | 0.5 L/hr at 5 K w/LHe | 1.1 L/hr at 5 K w/LHe | 0.1 L/hr at 77 K w/LN ₂ | N/A | Approx. 0.3 L/hr |

Note: Specifications do not include parasitic or experimental heat loads.



VFP-800-FTIR



PT-950-5 for FTIR



HE-3 Cryostat for FTIR

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