



# Forensic Chemistry Section

## Fourier Transform Infrared Spectrometer Policy

### 1. Scope

This document outlines the policies governing the use of the FTIR.

### 2. Policies

- 2.1 The examiner will refer to the instrument manuals for instructions whenever necessary.
- 2.2 Library reference spectra will be used for polymer identification.
- 2.3 Known and unknown samples will be compared to determine if their chemical compositions are consistent.
- 2.4 IR analyses of other samples will follow macroscopic examinations, microscopic examinations, and other necessary examinations.
- 2.5 The quantity and number of samples used will differ according to:
  - Specific techniques and sample preparation
  - Sample homogeneity
  - Condition of the sample
  - Other case dependent analytical conditions and/or concerns
- 2.6 Preparation must be the same for all samples being compared.
- 2.7 Samples with several layers will be separated if possible.
- 2.8 A minimum amount of sample necessary for analysis will be used (approximately 100  $\mu\text{m}$  square).
- 2.9 Samples will be analyzed in transmission mode.
- 2.10 Replicate samples will be taken whenever sample size permits. Three scans are suggested to ensure sample homogeneity.
- 2.11 The IR window material should not reduce the effective spectral range of the detector. Common IR window materials used, but are not limited to, are NaCl, KBr, CsI, BaF<sub>2</sub>, ZnSe, and diamond.
- 2.12 The examiner will note which IR window material is used and whether one or two windows are used.



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- 2.13 If several samples are mounted in a single mount, they must be well separated and properly documented.
- 2.14 When selecting aperture parameters and positioning, light throughput, stray light reduction, and aperture focus in the sample image plane must be considered.
- 2.15 The sample aperture should lie within the boundaries of the sample edges.
- 2.16 Sample alignment should be consistent throughout an analysis and, if possible, for all analyses on the system.
- 2.17 Samples should be focused as close to the center of the sample as possible and centered on the optical axis of the system.
- 2.18 The detector measurement aperture size will be adjusted to just slightly less than the size of the sample.
- 2.19 The detector aperture size may vary with sample geometry, but must not allow the detector to be saturated when acquiring a background spectrum.
- 2.20 The size and position of the apertures must not vary between sample and background scans for a given analysis.
- 2.21 The instrument will be run with a minimum of 64 scans and a resolution of  $4\text{cm}^{-1}$  or better.
- 2.22 A background spectrum, which includes all of the components except the sample of interest and the same system parameters, will be collected for each questioned sample. If multiple samples are mounted on a single mount the same background measurement can be used for all of the samples if the aperture size is the same.
- 2.23 Instrument performance and calibration check will be evaluated on a regular basis or with each group of casework. Calibration check data will be maintained electronically on the instrument computer. If the instrument is out of calibration, a quality assurance report will be generated and the section supervisor will be notified.
- 2.24 A NIST certified polystyrene film standard will be used as the basis for the calibration. An electronic version of the spectra obtained from this standard will be compared against regular instrument performance and calibration checks.



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- 2.25 Regular calibration checks will be performed using polystyrene film. Wavelength accuracy for the polystyrene film spectrum must be within 1 wavenumber when checked against the absorption bands at 3082.4, 3060.3, 1601.6, 1583.5, and 1028.7 wavenumbers. The peaks at these wavenumbers should be marked.
- 2.26 All data will be saved immediately after generation and prior to any modification.
- 2.27 A library of reference spectra will be maintained.
- 2.28 A variety of reference paint and fiber samples will be available for comparison purposes.
- 2.29 The positions of the absorption bands according to wavelength or wavenumber and their relative intensities will be compared with those of a known reference spectrum.
- 2.30 Similarity or dissimilarity in the IR spectra will be noted when making comparisons.
- 2.31 Instrumental and data collection parameters are stored electronically with the instrumental data.
- 2.32 The instrument will be cooled with liquid nitrogen prior to use.
- 2.33 Data will be backed up on a regular basis by being copied to the laboratory network drive.
- 2.34 If an examiner requires further instructions, the instruction manual is located electronically within the software.
- 2.35 The instrument is maintained in the secure access portion of the laboratory. Should the instrument require storage or transportation, the laboratory will contact the manufacturer for guidance.