

All data taken at Pacific Northwest National Laboratory (PNNL)
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Composite spectrum for METHSCL_50T

Effective burden of composite spectrum: 1 part-per-million-meter (ppm-meter) at 296 K

Equivalent concentration x path-length of composite spectrum: 4.7159×10^{-6} grams/liter-meter

Unidentified trace impurity peaks observed at 1364 and 796 cm^{-1} .

Sample Conditions-

- Chemical name and CAS number: Methanesulfonyl chloride, mesyl chloride, MsCl, $\text{CH}_3\text{SO}_2\text{Cl}$: [124-63-0]
- Physical properties: fw=114.547 g/mole, fp=-33° C, bp=164° C
- Supplier and stated purity: Aldrich, 99.5%
- Sample class: III (PNNL scale). Low vapor pressure sample
- Temperature of sample: 25.01 ± 0.02 C
- Diluent: Sample back filled with ultra high purity nitrogen to 760 ± 5 Torr
- Individual samples at 1.04980, 0.52430, 1.5200, 1.6750, 0.31420, 0.22820, 0.73480 and 1.2130 Torr. Path length = 19.94 cm. Final data is a composite spectrum.
- Preparation: Multiple freeze-thaw cycles at 0 C to remove air.

Instrument Parameters-

- Bruker-66V FTIR, temperature controlled environment, evacuated optics bench
- Modified to include second aperture, between interferometer output and sample cell. This substantially reduces both “ghosting” and warm aperture effects.
- Spectral range: 6,500 to 520 cm^{-1} (1.534 to 19.231 microns)
- Instrumental resolution based on maximum interferometer displacement is 0.112 cm^{-1}
- Spectral interval after 2X zero-filling interferogram and FFT: 0.06 cm^{-1}
- Interferogram zero-fill: 2X
- Apodization: Boxcar
- Phase correction: Mertz
- Beam splitter: Potassium bromide (KBr)
- IR source: Carbide glowbar (22 V)
- Scanner velocity: 60KHz (HeNe crossing frequency)
- Number of interferograms averaged per single channel spectra: 256
- Detector: Mid-band HgCdTe, photoconductive, 77K operation
- Folding limits: 15798 to 0 cm^{-1}

Post Processing and Related Parameters-

- Non-linearity detector correction (Bruker proprietary) applied to interferogram ($\alpha = 0.85$, $\beta = 530$)
- Composite spectrum created from 8 individual absorbance (base-10) spectra via classical least squares fit: Intercept=0, slope is fitted, individual absorbance values weighted by T^2 (transmission squared), all absorbance values > 1.6 are given zero weight
- Calculated and estimated errors: Type A = 1.94%, Type B = 10%
- Frequency correction (already applied): $V(\text{corrected}) = V(\text{instrument}) * 0.99999896 + 8.812 \times 10^{-4}$
- Axis units: X=wavenumbers (cm^{-1}), Y=Absorbance (base-10)
- Trace water vapor, carbon dioxide and HCl features removed via spectral subtraction
- Baseline correction via 7th order polynomial subtraction