

All data taken at Pacific Northwest National Laboratory (PNNL)
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Version 1.0, March 12, 2010.

Composite spectrum for C15H32_50T

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

Equivalent concentration x path-length of composite spectrum: 8.7452×10^{-6} grams/liter-meter

Sample Conditions-

- Chemical name and CAS number: Pentadecane; n-Pentadecane; CH₃(CH₂)₁₃CH₃; C₁₅H₃₂ : [629-62-9]
- Physical properties: MW=212.4146 g/mole, mp=10° C, bp=267° C, Density (25 C) = 0.769 g/cm³
- Supplier and stated purity: Sigma Aldrich, 99%
- Sample class: I (PNNL scale).
- Temperature of White cell (805.0 cm optical path length) 50 ± 2 C
- Diluent (high purity nitrogen) flowed at 23.3 liter/min (21.1° C), ambient atmospheric pressure 760 ± 5 Torr.
- Samples flowed at microliters/minute 1.000, 2.000, 0.600, 1.200, 1.500, 2.500, 0.800, 1.400, 2.800, 1.600, 1.800, 3.200, 4.000 and 5.000
- Individual samples at equivalent pressures of 0.002832, 0.005663, 0.001699 0.003395, 0.004241, 0.007062, 0.002259, 0.003953, 0.007905, 0.004516, 0.005078, 0.009028, 0.011282 and 0.014101 Torr. Final data is a composite spectrum.
- Preparation: None

Instrument Parameters-

- Bruker-66V FTIR, evacuated optics bench.
- Modified to include second aperture, between interferometer output and White cell. This substantially reduces both “ghosting” and warm aperture effects.
- Spectral range: 6,500 to 600 cm⁻¹ (1.538 to 6.67 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 ($\alpha=0.90$, $\epsilon=500$)
- Composite spectrum created from 14 individual absorbance (base-10) spectra via classical least squares fit: Intercept=0, slope is fitted, individual absorbance values weighted by T² (transmission squared), all absorbance values ≥ 1.6 are given zero weight

- Calculated and estimated errors: Type A =8.49%, Type B \leq 7%
- Frequency correction (already applied): $V(\text{corrected})=V(\text{instrument})\cdot 0.9999996+6.17682\times 10^{-4}$
- Axis units: X=wavenumbers (cm^{-1}), Y=Absorbance (base-10)
- Trace water vapor, carbon dioxide and carbon monoxide were removed by spectral subtraction
- Baseline correction via 7th order polynomial subtraction