All data taken at Pacific Northwest National Laboratory (PNNL)
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Version 2.0, February, 01

Composite spectrum for ETHENE_50T
Effective burden of composite spectrum: 1 part-per-million-meter (ppm-meter) at 296 K
Equivalent concentration x path-length of composite spectrum: 1.155×10^{-6} grams/liter-meter

Sample Conditions-

- Chemical name and CAS number: Ethene, ethylene, bicarburetted hydrogen, $H_2C{:}CH_2$: [74-85-1]
- Physical properties: M.W. 28.05 amu, F.P. –169 C, B.P. 104 C
- Supplier and stated purity: Aldrich, 99.5+%
- Sample class: I (PNNL scale).
- Temperature of sample: 50.06 ± 0.02 C
- Diluent: Sample back filled with ultra high purity nitrogen to 760±5 Torr
- Individual samples at 1.11271, 8.4232, 2.2942, 5.2908 and 17.566 Torr. Path length = 19.96 cm. Final data is a composite spectrum.
- Preparation: Multiple freeze-thaw cycles at liquid nitrogen temperature to remove N_2 and O_2.

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 600 cm^{-1} (1.534 to 16.667 microns)
- Instrumental resolution based on maximum interferometer displacement is 0.112 cm^{-1}
- Spectral intervals after 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 (α=0.85, ε=530)
- Composite spectrum created from 5 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 = 1.19%, Type B ≤ 3%
- Frequency correction (already applied): V(corrected) = V(instrument)*0.999998+1.287×10^{-4}
- Axis units: X=wavenumbers (cm^{-1}), Y=Absorbance (base-10)
- Baseline correction via 7^{th} order polynomial subtraction