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Temperature-dependent infrared absorption cross sections of benzene vapor (C_6H_6)

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Pressure broadened (1 atm. N_2) absorption cross sections and integrated band intensities have been derived from laboratory spectra of C_6H_6 (benzene vapor) recorded at 278, 298, and 323 K, covering 600-6500 cm^{-1}. The spectra were recorded at a resolution of 0.112 cm^{-1} using a commercial Fourier transform spectrometer and a temperature-stabilized static sample cell. Absorption coefficients as a function of wavenumber were created at each temperature from fits at different sample pressures using a weighted, linear least-squares approach. Errors are 3% for stronger bands with systematic errors the primary source. We compare the results with previously reported values. The measured cross sections are potentially useful for remote sensing applications in particular to planetary atmospheres, and we focus on the ν_4 band that has been measured in Titan's upper atmosphere by the CIRS (Composite InfraRed Spectrometer) during Cassini spacecraft fly-bys. No dependence of the integrated ν_4 band intensity with temperature outside the experimental error was found, a result that is inconsistent with the $\sim$21% variation inferred previously from a best fit to 328 K to 229 K integrated ν_4 band intensities. Also, the ratio of our measured integrated intensities to those best-fit calculated values is $\sim$1.1-1.3. Our measured integrated band strengths for ν_4 are slightly higher but in excellent agreement with results obtained at

273, 298, and 323 K based on spectra recorded with a Bomem DA8 Fourier transform spectrometer at spectral resolutions of 0.03 and 1.0 cm^{-1}.