FT-IR MEASUREMENT OF n-BUTANE (n-C4H10) CROSS-SECTIONS IN THE 7-15 MICRON REGION AT 180 – 298 K FOR THE TITAN ATMOSPHERE

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We measured temperature-dependent cross-sections of n-butane (CH3-CH2-CH2-CH3) in the mid-infrared (7-15 μm) region. For this, we obtained 28 pure and N2-mixture spectra at 180–298 K using a high-resolution Fourier transform spectrometer (Bruker IFS 125 HR) at the Jet Propulsion Laboratory. The observed spectra were fit simultaneously to generate empirical pseudoline parameters, which include line intensities and empirical lower state energies at the individual pseudoline positions. We observed that the pseudolines could reproduce the observed spectra within 4 % through line-by-line radiative transfer calculations, showing the pseudoline parameters are an excellent practical alternative until the true spectroscopic line parameters become available. The integrated intensities at 296 K were measured to be 5.06(28), 7.18(27), 0.91(4), and 49.01(20)E-19 cm^{-1}/(molecule.cm^{-2}) in the 660-860, 860-1060, 1060-1200, and 1200-1538 cm^{-1}regions, respectively, by summing up the pseudoline intensity parameters. The pseudolines are electronically compiled in the HITRAN database format, which can be readily integrated with existing radiative transfer calculations. The measured cross-sections represented by the pseudolines could provide critical laboratory input in search of elusive species that might be captured in the Cassini/CIRS spectral observations.