INFRARED SPECTRA OF COMPLEXES CONTAINING ACETYLENE-d2

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Infrared spectra of the C_2D_2 dimer in the monomer ν_3 region ($\sim$2439 cm^{-1}) are observed by direct absorption using a rapid-scan tuneable diode laser spectrometer to probe a pulsed supersonic slit-jet expansion. We analyze the perpendicular K = 1-0 and 0-1 subbands of the vibrational mode involving the C_2D_2 monomer located at the top of the T-shaped dimer, but miss the parallel band involving the stem monomer vibration due to limited laser coverage. The results are consistent with previous work on acetylene dimers, but perturbations are much less evident than in the analogous infrared spectrum of C_2H_2.[a] As expected, the tunneling splitting in the excited state (8 MHz) is much smaller than in the ground state (424 MHz).[b] In the same region, we observe the H-bonded isomer of the C_2D_2-C_2H_2 dimer. This has not previously been observed, even though microwave spectra of almost every other conceivable deuterated isotopologue are known.[b] In addition to these acetylene dimers, our spectra also contain bands arising from impurities in the gas mixture which we assign to the C_2D_2-nitrogen and C_2D_2-water complexes

[a] G.T. Fraser, R.D. Suenram, F.J. Lovas, A.S. Pine, J.T. Hougen, W.J. Lafferty, and J.S. Muenter, *J. Chem. Phys.* **89**, 6028 (1988).
[b] K. Matsumura, F.J. Lovas, and R.D. Suenram, *J. Mol. Spectrosc.* **150**, 576 (1991).