

MICROWAVE ROTATIONAL SPECTRA OF THE Ar-C₂H₄ and Ne-C₂H₄ VAN DER WAALS DIMERS

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Rotational spectra of various isotopomers of the Ar-C₂H₄ and Ne-C₂H₄ van der Waals dimers were measured in the frequency range from 3.5 to 22 GHz using a pulsed jet cavity Fourier transform microwave spectrometer. The observed transitions are all of *a*-type. The observed spectra are consistent with planar, T-shaped equilibrium geometries. Tunneling splittings were observed for all transitions. This is attributed to an internal rotation motion of the ethylene unit within the complex. Ne-C₂H₄ shows a larger tunneling splitting than Ar-C₂H₄, which can be attributed to a lower tunneling barrier in the Ne-C₂H₄ case. Molecular symmetry group analyses using nuclear permutation inversion group theory can explain the observed intensity variation and the absence of certain transitions. Effective separations between the center-of-mass of ethylene and the rare gas atoms were obtained from the ground state rotational constants. *ab initio* calculations at the MP4 level were carried out on Ne-C₂H₄, and the results were compared with those from the experiments.