THE MILLIMETER-WAVE SPECTRUM OF THE WEAKLY BOUND ARGON-METHANOL CLUSTER

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The study of the structure and internal motion of weakly bound gas-phase clusters is of considerable interest in understanding the nature of intermolecular bonding. Van der Waals clusters with rare gas atoms such as argon are particularly interesting due to their ability to freely internally rotate about the host molecule. Additionally, many experiments that utilize argon as the buffer gas for supersonic expansions suffer from subsequent clustering of the argon to the sample of interest. In high-resolution spectroscopy, this can cause difficulties with line identification and assignment. Therefore, it is useful to have a complete and accurate characterization of the rotational transitions for such complexes. In our research, nearly all of our supersonic expansions involve the use of argon gas, and methanol is often a molecular starting material for the chemistry that we wish to study making the target of this study the Ar-CH_3OH cluster. The spectrum from 140-335 GHz was collected via direct absorption spectroscopy using a supersonic expansion of argon seeded with vapor from a pure methanol sample. Numerous spectral lines were detected across this frequency range. Spectral analysis was conducted using the Effective Rotational Hamiltonian program (ERHAM) due to the presence of a low barrier methyl rotor, which ERHAM is well-suited to address. The spectral results and associated analysis for Ar-CH_3OH will be presented here.