INFRARED SPECTRA OF THE CO_2-H_2O, CO_2-$(H_2O)_2$, and $(CO_2)_2$-H_2O COMPLEXES ISOLATED IN SOLID NEON BETWEEN 90 AND 5300 cm^{-1}

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The van der Waals complex of H_2O with CO_2 has attracted considerable theoretical interest since it is a typical example of a weak binding complex (less than 3 kcal/mol), but a very few IR data are available in gas. For these reasons, we have studied in solid neon hydrogen bonded complexes involving carbon dioxide and water molecules. Evidence for the existence of at least three $(CO_2)_m(H_2O)_n$, or m:n, complexes has been obtained from the appearance of many new absorptions near the well-know monomers fundamental transitions. Concentration effects and detailed vibrational analysis allowed identification of fifteen, eleven and four transitions for the 1:1, 1:2, and 2:1 complexes, respectively. Careful examination of the far infrared allows the assignment of several 1:1 and 1:2 intermolecular modes, confirmed by the observation of combinations of intra+intermolecular transitions. All of these results significantly increase the number of one and, especially, two quanta vibrational transitions observed for these complexes, and anharmonic coupling constants have been derived. This study shows the high sensibility of the solid neon isolation for the spectroscopy of the hydrogen-bonded complexes since two quanta transitions can't be easily observed in gas phase.