MICROWAVE STUDIES OF COMPLEXES OF METHANOL WITH CARBON DIOXIDE AND FORMALDEHYDE

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The dimeric complexes, CH_3OH-CO_2 and CH_3OH-H_2CO, were observed with pulsed-beam Fourier transform spectrometers at NIST. For the formaldehyde complex a heated reservoir nozzle was employed and pressurized with a gas sample of 1% methanol in either Ne or Ar carrier and the nozzle heated to about 75 $^\circ C$. For the CO_2 complex, a cylinder containing 1% methanol and 1% CO_2 in Ar was used with a room temperature nozzle. Measurements were carried out from 8 GHz to 23 GHz. Both complexes exhibited internal rotation splitting due to internal rotation of the methyl group, and the formaldehyde complex showed an additional splitting on b-type transitions which is interpreted as a C_2 tunneling motion of the H_2CO monomer. Several isotopically substituted forms have also been studied for improved structure determination. The CO_2 complex is van der Waals bonded (C of carbon dioxide to O of the methanol), while the formaldehyde complex is hydrogen bonded (H of the hydroxyl group to O of formaldehyde). Discussion of the rotational, Stark, internal rotation, and structure analyses will be presented. These results will be compared to ab initio calculations, as well.