MICROWAVE SPECTROSCOPY OF THE NaCl-$(H_2O)_n$ (n = 1, 2, 3) COMPLEXES

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We report a microwave spectroscopic study of the NaCl-$(H_2O)_n$ (n = 1, 2, 3) complexes. In the frequency region from 5 to 25 GHz, rotational spectra of NaCl-$(H_2O)_n$ (n = 1, 2, 3) have been observed for the first time by using a Fourier-transform microwave spectrometer coupled to a laser ablation source. Molecular constants including the nuclear quadrupole coupling constants of Na and Cl nuclei were precisely determined for each complex. We observed various isotopic species of each complex to determine the molecular structures. NaCl-H_2O has a nearly planar and cyclic (Na-Cl-H-O) structure, NaCl-$(H_2O)_2$ has a C_2 structure with two equivalent H_2O, and NaCl-$(H_2O)_3$ is a symmetric top molecule with three equivalent H_2O. The determined structures clearly show that the bond length r(NaCl) increases monotonically with the number of H_2O. The determined nuclear quadrupole coupling constnats of the Na and Cl nuclei show considerable changes of charge distribution around these atoms.