PHOTODISSOCIATION SPECTROSCOPY OF Ca^+-H_2O IN THE TEMPERATURE-VARIABLE ION TRAP

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In the last two decades, developments of infrared spectroscopy and theoretical calculations on gas-phase molecular clusters have revealed detailed solvation structures of various systems, especially of hydrogen-bonded systems. One of the remained problems in studies on microscopic solvation or hydration is a temperature dependence of solvation structures. Lisy and coworkers succeeded in interpreting the hydration structures of alkali metal ions by taking temperature- or entropic effect[b]. They utilized Ar vaporization to cool down the temperature of clusters.

Another method for controlling temperature of cluster ions is a buffer gas cooling in an ion trap. In the present study, we have measured photodissociation spectra of Ca^+-H_2O in our temperature-variable ion trap[c]. In the present study, we examined the temperature of the Ca^+-H_2O in the trap by simulating the rotational profile of the 0-0 band of the $^2B_1 - ^2A_1$ transition. The observed rotational profile is similar to that reported by Duncan and coworkers[d]. By changing the trap period from 10 ms to 40 ms, it was confirmed that the trap period of 10 ms is sufficient to get temperature equilibrium in our experimental condition. Details of the experimental results will be presented in the paper.

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