

SPECTROSCOPIC INVESTIGATION OF TEMPERATURE EFFECTS ON THE HYDRATION STRUCTURE OF THE PHENOL CLUSTER CATION

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Owing to recent technical developments of various spectroscopies, microscopic hydration structures of various clusters in the gas phase have been determined so far. The next step for further understanding of the microscopic hydration is to reveal the temperature effect, such as a fluctuation of the hydration structure. Thus, we are carrying out photodissociation spectroscopy on the hydrated phenol cation clusters, $[\text{PhOH}(\text{H}_2\text{O})_n]^+$. Since electronic spectra of $[\text{PhOH}(\text{H}_2\text{O})_n]^+$ have been reported already^a, this system is suitable for our purpose.

In the present study, we use our temperature-variable 22-pole ion trap apparatus^b. The ions in the trap become thermal equilibrium condition by multiple collisions with temperature-controlled He buffer gas. By this way, the temperature of the ions can be controlled.

In the electronic spectrum of the $n = 5$ cluster measured at 30 K, a sharp band is observed. It shows that the temperature of ions are well-controlled. Contrary to the $n = 5$ cluster, the $n = 6$ cluster exhibits a wider band shape. The temperature dependence of the band shape indicates the existence of several, at least two, isomers in the present experimental condition.

^aS. Sato, N. Mikami *J. Phys. Chem.* **100**, 4765 (1996).

^bH. Ishikawa, T. Nakano, T. Eguchi, T. Shibukawa, K. Fuke *Chem. Phys. Lett.* **514**, 234 (2011).