銀および銅－アンモニア錯体の ZEKE 光電子分光

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ZEKE spectroscopy of the silver- and copper-ammonia complexes

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The single-photon zero kinetic energy (ZEKE) photoelectron spectra of the silver- and copper-ammonia 1:1 complexes have been observed to investigate the vibrational structures of their corresponding ions. The adiabatic ionization potentials of $AgNH_3$ (47580cm^{-1}) and $CuNH_3$ (46468cm^{-1}) decrease from those of the free metal atoms by 1.67 eV and 1.97eV, respectively. The intermolecular stretching frequencies were determined to be 375 cm^{-1} for Ag^+NH_3 and 463 cm^{-1} for Cu^+NH_3. These observations indicate that the Cu^+-NH_3 binding is stronger than the Ag^+-NH_3 binding, being consistent with the previous collision induced dissociation experiments. In addition, the smaller red-shift of the origin band of $CuNH_3$ on deuteration and the different Franck-Condon patterns of the spectra indicate that the $CuNH_3$ complexes are more strongly bound than $AgNH_3$ also in the neutral states. The binding energies of these neutral complexes derived from the observed I.P. shifts and the previously reported binding energies of M^+-NH_3 are consistent with this observation. The stronger binding of $CuNH_3$ in the neutral ground state is mostly due to the more efficient *sd* hybridization that alleviates the repulsion between the metal atom and the ammonia molecule.