Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Dynamics and Fragmentation of Hydrogen Bonded and van der Waal Clusters upon 26.5 eV Soft X-ray Laser Ionization FENG DONG, SCOTT HEINBUCH, ELLIOT BERNSTEIN, JORGE ROCCA, Colorado State University, DEPARTMENT OF CHEMISTRY/COLORADO STATE UNIVERSITY TEAM, DEPARTMENT OF COMPUTER AND ELECTRICAL ENGINEERING/COLORADO STATE UNIVERSITY TEAM — A desk-top soft x-ray laser is applied to the study of water, methanol, ammonia, sulfur dioxide, carbon dioxide, mixed sulfur dioxide-water, and mixed carbon dioxide-water clusters through single photon ionization time of flight mass spectroscopy. Almost all of the energy above the vertical ionization energy is removed by the ejected electron. Protonated water, methanol, and ammonia clusters dominate the mass spectra for the first three systems. The temperatures of the neutral water and methanol clusters can be estimated. In the case of pure $SO_2$and CO_2, the mass spectra are dominated by $(SO_2)_n^+$ and $(CO_2)_n^+$ cluster series. When a high or low concentration of $SO_2/CO_2$is mixed with water, we observe $(SO_2/CO_2)_nH_2O^+$or $SO_2/CO_2(H_2O)_nH^+$ in the mass spectra, respectively. The unimolecular dissociation rate constants for reactions involving loss of one neutral molecule are calculated for the protonated water, methanol, and ammonia clusters as well as for SO_2 and CO_2 clusters. We find that the 26.5 eV soft x-ray laser is a nearly ideal tool for the study of hydrogen bonded and van der Waals cluster systems and we are currently exploring its usefulness for other more strongly bound systems.

Scott Heinbuch
Colorado State University

Date submitted: 06 Feb 2006 Electronic form version 1.4