ELECTRONIC SPECTROSCOPY OF COLD BIOMOLECULAR IONS IN THE GAS PHASE

JAIME A. STEARNS, MONIA GUIDI, SEBASTIEN MERCIER, OLEG V. BOYARKIN, and THOMAS R. RIZZO, *Laboratoire de Chimie Physique Moléculaire, Ecole Polytechnique Fédérale de Lausanne, CH-1015, Lausanne, Switzerland*.

The study of the spectroscopy of biologically relevant molecules has traditionally been hindered by the complexity of the spectra at room temperature and in solution. The spectral congestion is typically alleviated by studying the molecules in the gas phase in the cold environment of a supersonic jet, but it becomes increasingly difficult to produce sufficient quantities of intact, gas phase biomolecules with increasing molecular size. We present here a method to study the spectroscopy of biomolecular ions in the gas phase at temperatures less than 10 K. The ions are produced from solution in a nanoelectrospray source, mass selected by a quadrupole, and guided into a linear 22-pole ion trap which is cooled to 6 K by a closed cycle helium refrigerator. While inside the trap, the ions are interrogated by an ultraviolet laser, causing photofragmentation when the laser is resonant with an electronic transition in the ion. Following ejection from the trap, a second mass analyzing quadrupole selects the photofragments for detection. We have applied this method to a range of species, including protonated amino acids such as tryptophan and tyrosine and their water clusters, polypeptides, and larger systems such as the 13 kDa protein cytochrome C. Comparisons between our spectra and those of the neutral molecules in the supersonic jet environment and in solution will be discussed.