POPULATION TRANFER SPECTROSCOPY: NEW PROBES OF THE DYNAMICS OF FLEXIBLE BIOMOLECULES

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Infrared Population Transfer Spectroscopy (IRPTS) and Hole-Filling Spectroscopy (HFS) have recently been developed by our group as a means to study gas-phase conformational dynamics of flexible biomolecules. These methods utilize selective infrared excitation of single conformations of the molecules of interest in the early portions of a gas-phase expansion, followed by collisional re-cooling of the excited population into its conformational minima for subsequent conformation-specific detection. These techniques can serve as a powerful probe to study both collisional and conformational dynamics of flexible biomolecules and their associated water clusters in a supersonic expansion. We have recently demonstrated the ability to determine Population Transfer Quantum Yields for dipeptide analogs of tryptophan and the hormone melatonin; molecules for which a large number of conformational degrees of freedom exist. In addition, we are able to determine semi-quantitative information about barriers to intramolecular conformational isomerization, quantitative information about the fractional populations of the conformers in the absence of infrared excitation and the conformational consequences of X-$(H_2O)_n$ dissociation dynamics. Application of the aforementioned techniques to a selection of mimetic peptide oligomers will be discussed.