IR-PIRI AND IR-PHOTODISSOCIATION SPECTROSCOPY PERFORMED ON AROMATIC IONS AND HYDROGEN-BONDED CLUSTERS

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The new developed IR-PIRI (IR-Photo Induced Rydberg Ionization) spectroscopy can be used to investigate CH-, NH-, and OH-stretching vibrations of aromatic cations and hydrogen-bonded clusters. IR-PIRI spectroscopy is a MATI (MAss Threshold Ionization) depletion method, i.e. the Rydberg neutrals contributing to a MATI signal can be autoionized by exciting CH-, NH-, and OH-stretching vibrations of the ionic core. The knowledge of these vibrational frequencies lead to important information on structure and reactivity of the cation. IR-PIRI spectroscopy offers the possibility to perform a state selective spectroscopy of the cation, since different vibrational levels of the ion can be obtained by MATI spectroscopy. In case of (larger) clusters which cannot be investigated by MATI spectroscopy the CH-, NH-, and OH-stretching vibrations of the ions can be obtained by resonant IR-Photodissociation spectroscopy. Using this method the ions are generated by a resonant R2PI (Resonant 2-Photon Ionization) process which is mass and isomer selective with respect to the neutral cluster. The ionic cluster dissociates after resonant excitation of CH, NH-, or OH-stretching vibrations. IR-PIRI and IR-Photodissociation spectroscopy have been applied to the ions of different substituted benzenes, indole and the corresponding hydrogen-bonded clusters with water.