Infrared photodissociation of gas phase ions - single photon and multiphoton events

- - Gas


Observation of vibrational overtones by single molecule resonant photodissociation

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Abstract

Coulomb crystals composed of atomic ion and molecular ions are an ideal system for performing high-precision spectroscopy with applications in astrochemistry and fundamental physics. Here we show that this same system can be coupled with a broadband laser to discover new molecular transitions. We use three-ion chains of Ca^+ and CaH^+ to observe vibrational transitions via resonance enhanced multiphoton dissociation detected by Ca^+ fluorescence. Based on theoretical calculations, we assign the observed peaks to the transition from the ground vibrational state, $v = 0$, to $v = 9$ and $v = 18$. Our method allows us to track single molecular events, and it can be extended to work with any molecule by using normal mode frequency shifts to detect the dissociation. This survey spectroscopy serves as a bridge to the precision spectroscopy required for molecular ion control.

arXiv:1505.05283v1 [physics.atom-ph] 20 May 2015

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Ions and Light

A dual cryogenic ion trap spectrometer for the formation and characterization of solvated ionic clusters. The Journal of Physical Chemistry A 2009, 113 29 , 8169-8175. Nevertheless, the presence of a companion star should not be considered surprising, since it has been proposed for well-studied evolved stars, such as IRC +10216 and the pre-planetary nebula CRL 618 Velázquez et al.

Infrared photodissociation spectroscopy

Structural Melting of an Amino Acid Dimer upon Intersystem Crossing. Cisplatin and transplatin interaction with methionine: bonding motifs assayed by vibrational spectroscopy in the isolated ionic complexes. Publication in Nature Chemistry: An Infrared Spectroscopy Approach to Follow β-Sheet Formation in Peptide Amyloid Assemblies September 26, 2016 Amyloidogenic peptides and proteins play a crucial role in a variety of neurodegenerative disorders such as Alzheimer's and Parkinson's disease.

NSF Award Search: Award#0718320

Binding motifs of cisplatin interaction with simple biomolecules and aminoacid targets probed by IR ion spectroscopy. The Spectroscopy of Ions Stored in Trapping Mass Spectrometers. Concerning the astrophysical synthesis of methylated benzene, different routes of formation are proposed in the literature, but no consensus has yet been reached.

Infrared multiple

The electron attachment process is no doubt affected by the protonation sites and conformation of the parent peptide. Summary References Chapter 25 Relaxation Dynamics of Open-Shell Cations Studied by Photoelectron-Photon Coincidence Spectroscopy I.

Infrared multiphoton dissociation

The Journal of Chemical Physics 2017, 147 1 , 013928.

Vibrational Characterization of Simple Peptides Using Cryogenic Infrared Photodissociation of H2

March 2015 at the Fritz Haber Institute of the Max Planck Society in Berlin. It is defined as the interaction of one or more photons with one target molecule. The effectiveness of photons of different wavelengths depends on the absorption spectra of the in the organism.

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Peptide radicals and cation radicals in the gas phase. IRMPD kinetics indicating different photodissociation behavior for different isomers obtained at isomer-specific resonances are used to determine relative populations of salt bridge and charge-solvated isomers for ArgGly·Na +, Ser·Cs +, and Arg·Na +. Quantum simulations of the hydrogen molecule on ammonia clusters.

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