INFRARED ACTION SPECTROSCOPY OF SINGLE MOLECULES

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We report the first infrared spectra taken of single trapped molecular ions. Analyzing samples one molecule at a time allows for fundamentally different approaches to chemical analytics than is possible in the usual ensemble case, where chemical separation is often a prerequisite for resolving complex mixtures. Briefly, a single molecular ion is repeatedly tagged with an N2 molecule and detagged via infrared excitation, and these events are detected via non-destructive mass spectrometry via a co-trapped atomic ion. Extensions to ion chemistry, mixture analysis, precision measurement, and spectroscopy of radicals will be presented.