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Intense-field ionization of heterocyclic organic molecules: fragmentation and metastable states[1] DAVID FOOTE, TIM SCARBOROUGH, CORNELIS UITERWAAL, University of Nebraska, Lincoln — Pyridine and the diazine molecules (pyridazine, pyrimidine, and pyrazine) are ionized by intense-field, ultrafast (50 fs), 800 nm laser pulses, and the resulting ion mass spectra are recorded as a function of laser intensity (ranging from $\sim 10^{13}$ W/cm^2 to $\sim 10^{15}$ W/cm^2). Log-log plots of ion yield vs. intensity suggest resonance-enhanced multiphoton ionization (REMPI) mechanisms. These measurements are made possible by a unique tuning of the time of flight mass spectrometer that eliminates the focal volume effect in the ion yields. We also report on the fragmentation of the molecular ions under these same conditions. Fragment ion yields vary greatly when measured from different molecular parents, even those coming from the same mass. Furthermore, we observe evidence of metastable decays in the ion mass spectrometer, and measure the decay product mass by deliberately detuning the potentials on the time of flight mass spectrometer. This result is presented as a method of determining the nature of the metastable fragments—their masses and kinetic energy distributions.

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