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Intense-field Ionization and Fragmentation of Heterocyclic Organic Molecules: the Azabenzenes¹ TIMOTHY SCARBOROUGH, COLLIN MCACY, DAVID FOOTE, CORNELIS UITERWAAL, University of Nebraska - Lincoln — We report on the ultrafast intense-field photoionization and fragmentation of pyridine, pyridazine, pyrimidine and pyrazine. These four molecules represent a systematic series of perturbations into the structure of a benzene ring which explores the substitution of a C-H entity with a nitrogen atom, creating a heterocyclic structure which remains isoelectronic with benzene. Other than pyridine, each molecule has the same chemical formula, with the only difference being the relative placement of the two perturbing nitrogen atoms (ortho-, meta- or para-substitutions). Data is recorded under intense-field, single-molecule conditions. 50 fs, 800 nm pulses are focused into the molecular vapor, and ion mass spectra are recorded for intensities of 10^{13} to 10^{15} W/cm² in the absence of the focal volume effect. For all targets, stable singly- and doubly-charged parent ions ($C_{6-n}H_{6-n}N_n^{+(+)}$) are observed with features suggesting resonance enhancement (REMPE). Fragmentation dynamics differ greatly between molecules, with each species showing evidence of metastable decay processes.

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