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Athwart Proton Migration in Polyatomic Molecules during Strong-Field Laser Pulse DMITRI ROMANOV, Department of Physics and Center for Advanced Photonics Research, Temple University, ALEXEI MARKEVITCH, Department of Chemistry, Temple University, STANLEY SMITH, Deaprtment of Chemistry, Wayne State University, ROBERT LEVIS, Department of Chemistry and Center for Advanced Photonics Research, Temple University — Coulomb-explosion fragmentation of large polyatomic molecules caused by strong non-resonant laser field may involve complex motion of constituent protons during ulrashort laser pulse. We compare kinetic energy distributions of H+ ions produced in the Coulomb-explosion dissociation of anthracene, ($C_{14}H_{10}$), 1,2,3,4,5,6,7,8-octahydroanthracene, (OHA, $C_{14}H_{18}$), and 9,10-anthraquinone, (AQN, $C_{14}O_2H_8$), subjected to 60 fs, 800 nm laser pulses of intensity between 0.4 and 4.010^{14} Wcm^{-2}. The distributions are signatures of the molecular structure effects on the energy coupling and the proton motion over the pulse duration. Most revealing are the curves of the kinetic energy cutoff as a function of the laser intensity: they reflect prolong nonadiabatic charge localization in the molecular ions. The cutoff curve for AQN differs drastically from those for anthracene and OHA, demonstrating much greater saturation value ($\sim$80 eV compared to $\sim$50 eV). The differences are interpreted in terms of proton migration across the electric field on the initial stage of fragmentation process. This migration is caused by nonadiabatic electron dynamics; our model calculations agree with the experimental data.

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