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Probing Strong-Field Electron-Nuclear Dynamics of Polyatomic Molecules Using Proton Motion ROBERT LEVIS (1,3), ALEXEI MARKEVITCH (1,3), DMITRI ROMANOV (2,3)[1], STANLEY SMITH (1,3), (1) Department of Chemistry, (2) Department of Physics, and (3) Center for Advanced Photonics Research, Temple University, Philadelphia, PA 19122 USA — Protons ejected from a large polyatomic molecule during its Coulomb explosion can carry information about the dynamics of explosion and pre-explosion processes related to specific molecular structure. To extract this information, the proton kinetic energy distributions were derived from the shape or the time-of-flight proton peak for three structure-related molecules, anthracene, octohydroanthracene, and anthraquinone, subjected to intense 800 nm, 60 fs laser pulses. The kinetic energy distributions are found to be markedly molecular-specific, providing insight into similarities and differences in the nonadiabatic electron-nuclear dynamics in these molecules during the laser pulse. In particular, analysis of the proton energy distributions reveals molecular specificity of non-adiabatic charge localization and field-mediated restructuring of polyatomic molecules polarized by strong laser fields.

[1]daroman@temple.edu

Dmitri Romanov
Temple University

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