

CLUSTER DYNAMICS AT EXTREMES

In memory of Professor Jaroslav Koutecký

Joshua Jortner
School of Chemistry, Tel Aviv University,
Ramat Aviv, 69978 Tel-Aviv, Israel

The exploration of photoinduced ultrafast response, dynamics, reactivity and function in ubiquitous molecular, nanoscale macroscopic and biological systems pertains to the interrogation and control of the phenomena of energy acquisition, storage and disposal, as explored from the microscopic point of view. We shall focus on recent theoretical, computational and experimental studies of finite systems dynamics under extreme energetic and temporal conditions. Ultrafast and ultrahigh phenomena pertain to extreme cluster ionization in ultraintense laser fields (peak intensities $I_M = 10^{15} - 10^{21} \text{ Wcm}^{-2}$, with $I_M = 10^{21} \text{ Wcm}^{-2}$ constituting the highest light intensity on earth), ultrafast femtosecond dynamics on the time scale of nuclear motion, attosecond–femtosecond electron dynamics, the production of ultrahigh charges in completely ionized molecular or elemental clusters, and the attainment of ultrahigh energies (keV–MeV) in Coulomb explosion of multicharged clusters and nanostructures. Coulomb explosion of clusters and nanostructures transcends chemical–physical dynamics towards the driving of nuclear reactions involving table-top nuclear fusion and nucleosynthesis of astrophysical interest.

References:

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