Chemical Dynamics at Extremes. Table – top

Nuclear Fusion Driven by Cluster Coulomb Explosion

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The exploration of photoinduced ultrafast response, dynamics, reactivity and function in clusters, nanostructures and biological systems pertains to the interrogation and control of the phenomena of energy acquisition, storage and disposal, as explored on the molecular level. We shall focus on recent theoretical and computational studies of finite systems dynamics under extreme energetic and temporal conditions. Ultrafast and ultrahigh phenomena pertain to extreme cluster ionization in ultraintense laser fields (with peak intensities of up to $I_M = 10^{21}$ Wcm^{-2}, which constitutes 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 ion energies (keV–MeV) in Coulomb explosion of multicharged clusters. Coulomb explosion of clusters and nanostructures transcends chemical dynamics towards the driving of nuclear reactions involving table-top nuclear fusion and nucleosynthesis of astrophysical interest.