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Energetic Ion Generation in Intense Femtosecond Laser Interaction with Clusters KATSUNOBU NISHIHARA, VASILII ZHAKHOVSKII, TOSHIYUKI HIRAO, H. AMITANI, ILE, Osaka Univ., SERUGEI BULANOV, TIMUR ESIRKEPOV, APR, JAERI — Interaction of an intense femtosecond laser pulse with clusters has given a new insight in ionization processes and collective phenomena such as strong radiation emission and generation of high energy ions. We have studied Coulomb explosion of large molecule and clusters driven by intense femtosecond laser interaction, with use of 3d-MD simulations including electron dynamics and 3d-PIC simulations, in which ionization processes are taking into account. We mainly discuss energy spectra of ions in Coulomb explosion of clusters following that laser light expels electrons. In addition to relatively uniform explosion of ions, it is also observed that in circularly polarized laser interaction of normalized laser field of eA/mc=50 with relatively large cluster of 800 nm in radius, energetic ions of up to 400 MeV are accelerated forward by electric field of 150 TV/m induced in a core of the cluster. This large electric field is induced due to density increase, approximately 40 times higher than its initial density. Both the ion energy and induced electric field intensity are about ten times greater than those previously known. The acceleration of ions forward is however not observed in linearly polarized laser interaction.

> Katsunobu Nishihara Institute of Laser Engineering, Osaka University

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