Quasi-monoenergetic ions from Coulomb explosion of composite clusters

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Coulomb explosion of pure ion nanoplasmases is an important problem in the field of ultra intense laser-cluster interaction with relevance for plasma physics, fusion research [1, 2] and imaging by "diffraction before destruction" [3].

In this poster, a detailed study of Coulomb explosion in composite clusters consisting of different atomic species is presented. The work focuses on heavy-light systems made of hydride molecules composed by C, H, N and O, in order to collect valuable information for coherent diffractive imaging [4].

Numerical simulations have been performed by using the shell method [5] that despite of its simplicity allows to capture all the relevant physics involved with the advantage of a reduced computational time. Numerical results indicate that, in the presence of different ion species, lighter ions are accelerated in a quasi-monoenergetic way, in contrast with the well known results about Coulomb explosion of clusters composed by a single ion species, where the energy spectrum is much wider. A theoretical model, useful for a deep comprehension of the explosion dynamics, has been developed for the case of a two-species pure ion spherical plasma; results of the theoretical model have been compared with numerical simulations showing a perfect agreement.

References