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Femtosecond study of the interaction of intense femtosecond laser pulse with Kr clusters using Landau damping

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Abstract:

We study the rare gaz cluster (Kr and Ne) contained 10^3 to 10^5 atoms per cluster, irradiated by an intense femtosecond laser pulse. The irradiation of these clusters with the intense laser leads to high excitation energy which is the source of the energetic electrons, high ion charge state and fragmentation process.

We have used the modified nanoplasma model for the study of different mechanisms of ionization, expansion and explosion of the cluster. In this model, we consider a cluster with radius of few nanometers in a strong linearly polarized laser fields. The dimensions of the cluster are much smaller than the laser wavelength. The model treats: all ionization processes, heating, electron emission and expansion process. We study in detail the different parameters of the nanoplasma leading to the final explosion of the cluster with and without **landau damping**. We have found that the hydrodynamic pressure decrease to $\frac{1}{10}$ of its value with landau damping. We have also found electrons with energy up to 8keV.

Keywords
Nanomaterials, intense laser, rare gas clusters, landau damping.

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