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Ion acceleration due to explosions of nanoparticles driven by hot electrons MASAKATSU MURAKAMI, Institute of Laser Engineering, Osaka University, MOTOHIKO TANAKA, National Institute for Fusion Science — Plasma expansion into vacuum and resultant ion acceleration is studied both analytically and numerically, where the expansion of an initially uniform nanoparticle with radius R_{f0} and electron density n_{e0} is driven by explosion of thrmal electrons with initial temperature T_{e0}. Such key outputs as the energy spectrum, maximum ion kinetic energy, and electrons-to-ions energy transfer efficiency are explicitly given as a function of R_{f0}, n_{e0}, and T_{e0}. The simulation results turn out to be well reproduced by a self-similar solution [Phys. Plasmas Vol.13, 012105 (2006)], which describes an expansion of a finite-size non-quasi-neutral plasma mass into vacuum with a full account of charge separation effects.

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