

عنوان مقاله:

Simulation of Nanoparticles Growth Synthesized from Laser Ablation in Liquid by Electrical Charging Mechanism with and without Inclusion of Ion Drift Motion

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خلاصه مقاله:

In this paper, investigation and simulation of nanoparticles grown by laser ablation in a liquid (LAL) are studied. Firstly, the probable growth mechanisms including "hydrodynamic condensation" and "electrical charging" are introduced. Then, using the Orbital Motion Limited (OML) theory, governing differential equations of growth by electrical charging mechanism (without surface evaporation) are obtained in the absence of plasma drift motion. By numerical solving of the equations in the hot and high-density plasmas (typical of laser ablation in liquids), the growth of nanoparticles is simulated and the upper limit of its size is obtained. The results show that the size of nanoparticles, by electrical charging mechanism, cannot be more than 10 nm. In the continuation, a drift motion is added to the plasma ions up to 8 km/s which is typical of an expanding plasma in liquid phase ablation. Simulation results show that such a drift motion will cause the nano-particles to miss their spherical shapes and get a pine-like shape. It is concluded that if the growth of nano-particles really obeys the electrical charging mechanism then the shape of the obtained nano-particles in the plasma phase of the LAL should not be spherical but must be pine-like and rather larger.

کلمات کلیدی:

(Electrical charging, Growth mechanism, Ion drift motion, Laser ablation in a liquid (LAL), Orbital Motion Limited (OLM)

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