Interaction between ultrashort laser radiation and metal surface: Influence of multidimensional geometry to the formation of surface nanostructures

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Nanostructuring of the surface of irradiated metal is one of the most important effects caused by laser pulses exposure. Mechanisms of formation of nanostructures are very complex and there's a lot to be unknown. Extreme scenarios are the following: on the one hand, the interference of the incident electromagnetic wave and surface plasmons and on the other hand, the non-uniform ablation of the surface, i.e. hydrodynamic movement and (or) separation of substances. In case of resonance with plasmons the greatest importance has the factor of electromagnetic interference. In the other case of ablation thermal physics, hydrodynamics and phase transitions play the first role. Non-uniform ablation along the surface of the irradiated target is considered in the paper. In both cases in consideration non-uniformity is caused either by heterogenity of periodic modulation of the laser intensity along the surface of the target volume or by the finite size of the laser spot irradiating the thin film on the substrate. For the analysis of these cases the popular one-dimensional two-temperature model [1] is for the first timeexpanded to two-dimensional (2D) geometry.

[1] Anisimov S I, Kapeliovich B L and Perelman T L 1974 *Sov. Phys. JETP* **39** 375–377