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Laser ablation of metal into liquid: near critical point phenomena and hydrodynamic instability NAIL INOGAMOV, Landau Institute for Theoretical Physics, Chernogolovka 142432, Russia, VASILY ZHAKHOVSKY, Dukhov Research Institute of Automatics, Moscow 127055, Russia, VIKTOR KHOKHLOV, Landau Institute for Theoretical Physics, Chernogolovka 142432, Russia — Laser ablation of metal in contact with liquid differs much from ablation into vacuum. In spite of importance of this kind of laser-matter interaction (e.g., for nanoparticles production), the involved processes are still poorly understood. We show that to produce nanoparticles the laser absorbed energy should overcome the ablation threshold into vacuum by a few times. Thus the required temperatures in the heat-affected zone increase above a critical temperature. The flow of the substances, including propagation of a strong shock in liquid and a rarefaction wave inside the metal target, is analyzed. We demonstrate that the contact between metal and liquid, both being in their supercritical states, is hydrodynamically unstable. The instability is of the Rayleigh-Taylor type. Dynamics of the instability is important for separation of melt droplets which are frozen up to solid nanoparticles later.

Vasily Zhakhovsky
Dukhov Research Institute of Automatics, Moscow 127055, Russia

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