Impact of ultra-short laser pulses on metals and two-temperature hydrodynamic

Khohklov V.A.[1,@]

[1] Landau Institute for Theoretical Physics of the Russian Academy of Sciences, Akademika Semenova 1a, Chernogolovka, 142432, Russia

[@] v_a_kh@mail.ru

Due to the large difference in the masses of electrons and ions, the characteristic time of electron-electron relaxation τ_{ee} (and ion-ion relaxation τ_{ii}) is significantly less than that of electron-ion one τ_{ei}. This allows at intermediate times $\tau_{ee} << \tau << \tau_{ee}$ electron and ion subsystems to be considered as quasi-equilibrium, with their own temperatures T_e and T_i, which may differ significantly $T_e >> T_i$ [1]. At higher intensity of radiation or exposure to heavy metals, the substance begins to move noticeably at a substantially two-temperature stage. This makes it necessary to consider the equations of two-temperature thermodynamics [1] together with the equations of motion within a single two-temperature hydrodynamics [2].
The effect of two-temperature on laser ablation, vibrations of a metal film on a substrate and its delamination, etc. are considered. [3]

[1] Anisimov S I, Kapeliovich B L and Perel'man T L 1974 *Sov. Phys. JETP* **39**(2) 375–377 URL http://jetp.ras.ru/cgi-bin/r/index/e/39/2/p375?a=list

[2] Anisimov S I, Zhakhovskiĭ V V, Inogamov N A, Nishihara K, Petrov Y V and Khokhlov V A *J. Exp. Theor. Phys.* **103** 183–197 URL https://link.springer.com/article/10.1134/S1063776106080024

[3] Khokhlov V A *Two-temperature hydrodynamics under the action of ultrashort laser pulses on solid targets* Ph.D. thesis URL www.itp.ac.ru/ru/dissertation-council/thesis/fulltexts/2024-12-11.pdf, www.itp.ac.ru/ru/dissertation-council/thesis/abstracts/2024-12-19_*khokhlo*