Two-temperature kinetic coefficients of liquid aluminum in the conditions arising under the action of a femtosecond laser pulse

Petrov Yu V[1,2], Inogamov N A[1,3,@], Migdal K P[3,1], Mokshin A V[4] and Galimzyanov B N[4]

[1] Landau Institute for Theoretical Physics of the Russian Academy of Scienses, Akademika Semenova 1a, Chernogolovka, Moscow Region 142432, Russia
[2] Moscow Institute of Physics and Technology, Institutskiy Pereulok 9, Dolgoprudny, Moscow Region 141700, Russia
[3] Dukhov Research Institute of Automatics (VNIIA), Sushchevskaya 22, Moscow 127055, Russia
[4] Kazan Federal University, Kremlyovskaya 18, Kazan, Tatarstan 420008, Russia

[@] nailinogamov@gmail.com

Resistivity and thermal conductivity of aluminum in the liquid phase are calculated by using Ziman approach in the states, typical for the ablation process under the action of femtosecond laser pulse onto the metals. These states include the liquid metal of near normal density with different electron and ion temperatures at the early stage and also states with density and temperature close to their critical values. Electronic spectrum is found by the density functional method, the structural factor of a liquid is determined by the classical molecular dynamics method with the use of the interatomic potential via the "embedded atom" model. Relaxation time approach is used to calculate electrical conductivity and a resistivity as a reverse to it, and thermal conductivity is found by the use of Onsager coefficients in the relaxation time approach. The influence of various types of screening of electron-ion interactions onto the results of the theoretical calculations of resistivity and thermal conductivity is investigated.