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A WIDEBAND PLASMA MODEL FOR METALS AT HIGH ENERGY DENSITIES*

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The main objective the paper present is to develop the wideband plasma model of a metal at high energy densities (HED) on the basis of ideas expressed in [1-4].

Accounting mentioned above about HED and fact the melting specific heat of phase transition liquid – solid state is lower then that one for liquid-gas transition we will not differ liquid and solid state of matter .

We suppose the metal represents a mixture of two ‘liquids’: the ionic, consisting ion skeletons of identical weight occupying sites of a deformable lattice, and electronic, containing electrons of a continuous spectrum. The electron transitions between localized (discrete) and delocalized (continuous) states with total rate $\Gamma_e = \delta n_e / \delta t$ are taken in account in our model also. With the help of the approach developed by Andreev and Pushkarov [4] we deduced the two-liquid, two-temperature equations for describing the metal interaction with a pulse electromagnetic field within the framework of full Maxwell equations system in view of generation and recombination of the conduction electrons, and of their inertia. Expressions for electron and phonon transport in deformable crystal were obtained with the help of known methods solving of kinetic equations for phonons and conduction electrons.

In the case of slow electrophysical processes at high energy densities, one can ignore the displacement current and to use the one-liquid and one-temperature approximation. For this case, wideband expressions for the thermodynamic functions and electronic transport coefficients of aluminum are obtained. It is shown that the resulting equation of state for aluminum describes well the experimental Hugoniot adiabats known from the literature.

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