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The book consists of the abstracts of plenary, oral and poster contributions to the XXX International Conference on Interaction of Intense Energy Fluxes with Matter (March 1–6, 2015, Elbrus, Kabardino-Balkaria, Russia). The reports deal with the contemporary investigations in the field of physics of extreme states of matter. The following topics are covered: interaction of intense laser, x-ray and microwave radiation, powerful ion and electron beams with matter; techniques of intense energy fluxes generation; experimental methods of diagnostics of ultrafast processes; shock waves, detonation and combustion physics; equations of state and constitutive equations for matter at high pressures and temperatures; low-temperature plasma physics; physical issues of power engineering and technology projects.

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CHAPTER 3. EQUATIONS OF STATE FOR MATTER

$\Phi^{(3)}_{ijk}$ depends on 6 algebraically independent polynomials that are invariant under transformations of the group $O(3)\times S_3$ composed of the radius vector of the particle i, j and k [3]. We analyze the dependence of $\Phi^{(3)}_{ijk}$ on two invariants

$$I_1 = \mathbf{r}_{12}^2 + \mathbf{r}_{23}^2 + \mathbf{r}_{13}^2, \tag{4}$$

$$I_2 = \mathbf{r}_{12}\mathbf{r}_{23} + \mathbf{r}_{23}\mathbf{r}_{31} + \mathbf{r}_{31}\mathbf{r}_{12}. \tag{5}$$

Parameters of three-particle potential have been chosen using three-particle energy E_{ijk} calculated in the frame of density functional method.

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TWO-TEMPERATURE EQUATIONS OF STATE AND LATTICE STABILITY OF COPPER AND GOLD

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In this work the model of thermodynamic and transport properties of copper and gold at electron-ion non-equilibrium is presented. Accepted in the model ranges of electron temperature and pressure are enough to describe the experimentally achievable states [1, 2]. The changes in electron spectra due to electron heating and compression or expansion are taken into account with the help of two-parabolical model developed in [3]. In the cited work thermal conductivity and electron-ion coupling was considered as dependencies from electron and ion temperatures. Now the dependence from density for these coefficients is taken into account. To include exchange-correlation effects on electron-electron collisions we have found out how this effect can be included in electron screening. Also we have renewed our approach for heat conductivity calculation to include thermoelectric phenomena which are significant at high electron temperatures. The lattice stability [4] of solid copper and gold at electron-ion non-equilibrium is investigated; particularly, the effect of electron heating on sound velocities in metals called above. The two-temperature hydrodynamics simulation of film expansion was provided with the use of the

model presented here. This work was supported by RFBR (grant No 13-02-01078).

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THERMODYNAMIC, TRANSPORT AND OPTICAL PROPERTIES OF PLASTICS BY THE AB INITIO CALCULATION

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The plastics are widely used in high energy density physics. The usage of plastics for the contrast improvement of intense laser pulses [1] is an example of such a fruitful application.

The information on the matter properties is necessary to perform numerical simulation of the experiment. In this work we obtain thermodynamic, transport and optical properties of plastics by the *ab initio* calculation. The calculation is based on the quantum molecular dynamics, density functional theory and the Kubo-Greenwood formula. The detailed description of method, choice of technical parameters and comparison with other works is available for aluminum in paper [2].

The plastics of the effective composition CH_2 were investigated at $\rho = 0.954$ g/cm^3 and temperatures 5 kK $\leq T \leq$ 100 kK.

The pressure without kinetic contribution of ions $p - p_i^{\text{kin}}$ is almost constant at 5 kK $\leq T \leq$ 10 kK and grows at 10 kK $\leq T \leq$ 100 kK, total pressure p grows monotonically at 5 kK $\leq T \leq$ 100 kK. Thermal conductivity $C_v = dE/dT$ decreases at 5 kK $\leq T \leq$ 15 kK and increases at 15 kK $\leq T \leq$ 100 kK.

The dynamic electrical conductivity $\sigma_1(\omega)$ at 5 kK has non-Drude shape with peak at 10 eV; the curves are smoother at higher T.

Static electrical conductivity $\sigma_{1_{\text{DC}}}$ demonstrates step-like behavior—