About fast temperature effects when irradiating sodium chloride with ultrashort laser pulses

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Study of termomechanic ablation NaCl by of laser pulses 40 fs was carried out in [1]. In the work, which is devoted to the study of the effect of a 1 ps laser pulse on the surface of single-crystal graphite [2], it is noted that the peculiarity of the effect of ps and fs laser pulses on solid materials, with surface density of energy $\simeq$ 1 J/sm^2, consist in what, that main temperature process go after the end laser pulse. Thus, elastic unloading of a heated layer of NaCl with a thickness of h $\simeq$ 1 μm [1] will take place, according to our calculations, in h/v $\simeq$ 250 ps (since for NaCl the speed of sound is v = 4.4 km/s [3]). During a short laser pulse, spatial modulation of temperature and pressure occurs along the surface [2]. It is characterized by the temperatures of the ionic T_i and electron T_e subsystems and their variations (modulations): $\delta \mathrm{T}_i$ and $\delta \mathrm{T}_e$. In this case, the energy exchange parameter between the electronic subsystem and the lattice for NaCl can be taken to be $\simeq 10^{19}$ W/m^3·K. After the end of the laser pulse and alignment of $T_i = T_e$ and $\delta \mathrm{T}_i = \delta \mathrm{T}_e$ melting of the material occurs and a crater is formed [1]. Solidification of liquid NaCl occurs, according to our calculations, in $\simeq$ 2–5 ns. In similar experiments with an 80 fs laser pulse, the liquid phase of NaCl was reliably observed 0.5 ns after the pulse [4].

[1] Gavasheli Y O, Komarov P S, Ashitkov S I, Savintsev A P and Agranat M B 2016 *Dokl. Phys.* **61** 577–578

[2] Agranat M B, Anisimov S I, Ashitkov S I, Kondratenko P S and Fortov V E 2000 *Proceedings of ITES JIHT RAS* 195–204

[3] Vorobyov A A 1968 *Mechanical and heat properties alkalinehalide monokrystals* 272 p

[4] Savintsev A P and Gavasheli Y O 2013 *Dokl. Phys.* **58** 411–412