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# EXCITATION OF SOLIDS UNDER THE HIGH-INTENSITY HEAVY ION BEAMS

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Designed high-intensity heavy ion accelerator facilities (e.g. HIAF, FAIR) will provide unique experimental conditions for investigation of unusual extreme matter states under intense ion beams [1, 2].

To study temporal nanometric inhomogeneities of target excitation at the initial stage of material excitation under such bunches, we developed a hybrid model, in which initial electronic excitation parameters are provided by Monte-Carlo code TREKIS [3]. This code supplies with radial distributions of the electrons concentration and their energy density up to 10fs, when the most part of ionization cascades finishes, and propagation of electrons changes from ballistic to diffusion one. We use microscopic kinetic approach [4] to describe subsequent joint electron-lattice kinetics. The dynamical structure formalism is applied to evaluate cross sections governing electron-lattice coupling [5]. Thermal diffusion approach describes spatial spreading of lattice excitation. We take $Al_2O_3$ for modeling, since the most part of blocks of this model was already built and well tested for this system [5].

We demonstrate spatial asymmetry of lattice relaxation caused by overlapping of excited areas as well as percolation threshold of the molten zone in the beam spot.

REFERENCES

[1] J.C.Yang, J.W.Xia, G.Q.Xiao, et al., "High Intensity heavy ion Accelerator Facility (HIAF) in China" Nucl. Instruments Methods Phys. Res. Sect. B Beam Interact. with Mater. Atoms., 317 (2013) 263

[2] T. Stöhlker, V. Bagnoud, K. Blaum, et al., "APPA at FAIR: From fundamental to applied research" Nucl. Instruments Methods Phys. Res. Sect. B Beam Interact. with Mater. Atoms., 365 (2015) 680

[3] N.A. Medvedev, R.A. Rymzhanov, A.E. Volkov, "Time-resolved electron kinetics in swift heavy ion irradiated solids" J. Phys. D. Appl. Phys. 48 (2015) 355303

[4] S.A. Gorbunov, N.A. Medvedev, P.N. Terekhin, A.E. Volkov, "The microscopic model of material excitation in swift heavy ion tracks" Phys. Status Solidi. 10 (2013) 697–700

[5] S.A. Gorbunov, N. Medvedev, R.A. Rymzhanov, A.E. Volkov, " Dependence of the kinetics of $Al_2O_3$ excitation in tracks of swift heavy ions on lattice temperature" Nucl. Instruments Methods Phys. Res. Sect. B Beam Interact. with Mater. Atoms. 435 (2018) 83–86