PHASE TRANSITIONS IN CONDENSED MEDIA: CONNECTION WITH PHONONICS [[1]](#footnote-1)\*)

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Computer simulation in the field of physics of plasma-like media are carried out by the method of a stochastic analogue of nonequilibrium processes of formation of phase transition nuclei (PT) under the influence of radiation fluxes[1,2]. The solution of systems of Ito stochastic differential equations in the sense of Stratonovich / SDE / is associated with quasilinear partial differential equations of mathematical physics, the existence and uniqueness of the solution of SDE are proved. The implantation of ions with the formation of vacancy - gas pores (VGD) and their structures in the crystal lattice occurs at the fluctuation stage of the PT (~ 10 -4 s) in an "open" physical system. Stochastic dynamic variables,{g (t)} - VGD size, {x (t)}, {y (t)}, {z (t)} - ​​Cartesian coordinates of the center of mass, describe clustering of nuclei and Brownian motion / BM / using systems SDE, each solution uses 10 6 trajectories of the model's random processes[3]. The BM of defects in the lattice is caused by the potentials U (x, y, z, t) – which reflects long-range, indirect elastic interaction of the VGD with each other, with the boundaries of the computational domain and dislocations, which is carried out through the perturbation of vibrations of acoustic phonons in the lattice, calculated self-consistently. was previously derived using Feynman diagrams for weakly anisotropic lattices, the coefficients in which take into account the elastic moduli of the lattice planes.

In solids, VGD is an important factor that can affect the regulation of heat transfer; it is important to understand what thermal resistance is realized in their structures and at the boundaries of the metal and dielectric layers. Thermal phonons are scattered by defects. It is for this reason that the propagation of heat in a solid, in contrast to sound, is described by thermal diffusion, that is, a smooth change in the properties of a sample at different temperatures, according to phononics, a new branch of physics dealing with fine control of sound, ultrasonic and thermal vibrations in various structures [4]. Heat management and the use of phononics, or phonon devices, act as thermal diodes, thermal transistors, thermal logic circuits and thermal memory, they are used to transport and control thermal vibrations, that is, frequencies of the order of terahertz and higher. The wavelengths are only a few nanometers or less, then the corresponding structures must be fabricated with almost atomic precision. In principle, such multilayer structures (superlattices) can be made, but technically this is a much more laborious process. Computer simulation of porosity were used to study the properties of media for a one-dimensional photonic crystal and damage to multilayer metal technological mirrors , in diagnostics and prevention of degradation of cultural heritage objects, in creation of new materials for protective coatings and methods of their application, etc.

References

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