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SIMULATION OF TEMPERATURE FIELDS IN TARGETS AT COMBINATION OF REPETITIVELY-PULSED HIGH-INTENSITY ION IMPLANTATION AND ENERGY IMPACT ON A SURFACE*

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Methods to modify surface and near-surface layers of materials and coatings by ion beams are used in many fields of science and technology.

The method of high-intensity implantation by high-power density ion beams with submillisecond duration involves significant pulsed heating of the irradiated target's near-surface layer, followed by its rapid cooling due to heat transfer into the material due to thermal conductivity and the implementation of repetitively-pulsed radiation-enhanced diffusion of atoms to depths exceeding the projective ion range. Using the numerical simulation, this work studies the dynamics of changes in temperature fields in targets under single-pulse and repetitively-pulsed exposure to submillisecond titanium and aluminum ion beams with a pulsed power density up to 50 kW/cm^2. When simulating, two target materials (aluminum and titanium) are used, differing significantly in their characteristics. The conditions are determined under which the temperature in the ion-doped layer will correspond to the conditions of radiation-stimulated diffusion of the implanted element, and the temperature in the matrix material will not deteriorate its microstructure and properties.

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