INFLUENCE OF FAST RADIATION PROCESSES ON COOLING OF A METAL TARGET AFTER IRRADIATION BY A POWERFUL ION BEAM

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Results of an experimental research and modeling of cooling of a target after irradiation by powerful ion beam with energy density 1-10 J/cm^2 are presented. Researchers are executed on accelerator TEMP-6 (200-250kV with 120 ns duration). Experiments with stainless steel, titanium, brass, copper and tungsten target (thickness 75-200 μm) were carried out.The original estimation method of a thermal conductivity contribution in cooling of a heated target area of the target is presented. It is found that radiation defects formed in the target have a significant impact on the cooling dynamics of the target, which depends on the ratio of the target size and the ion beam. The cooling of a small target (the size of the target is smaller than the transverse dimensions of the ion beam) is satisfactorily described by two processes - the removal of thermal energy from the target due to thermal radiation and the release of energy at fast thermal annealing of radiation-induced defects. The cooling of the heated area of a large target, whose dimensions are much larger than the transverse dimensions of the powerful ion beam, occurs faster than it should be when cooled due to thermal radiation and thermal conductivity. It is shown that this can be caused by suppression of annealing of radiation defects due to migrationof interstitial atoms from the irradiation area.

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