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Clusterized surface transformation under intense heating generated by laser-accelerated proton irradiation PATRIZIO ANTICI, INRS, SIMONE GIUSEPPONI, ENEA, SIMON VALLIERES, MASSIMILIANO SCISCIO, INRS, MASSIMO CELINO, ENEA, MARIANNA BARBERIO, INRS — The acceleration of protons using ultra-intense ($I>10^{18}$ W/cm^2) short pulse (duration<1 ps) lasers, is a growing field of interest, in particular since their short bunch duration and their very intense and localized heating properties are perfectly suited for studies in warm dense matter or material science. In this letter we use laser-accelerated protons to analyze the effect of an intense and short (ns-scale) energy deposition process occurring on solid metal surfaces and studying its evolution on a ns and nm scale. We show that the thermal shock generates on the surface a uniformly distributed clustered heating, with dimensions of the clusters depending on the irradiated dose. When cooling down, the clusters produce large nanostructured surfaces. Controlling the dose allows obtained nanostructured surfaces with a low dispersion in particle dimension, high density of particles and polycrystallinity morphology.

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