Evolution of the microstructure of the near-surface copper layer during thermal cycling by nanosecond laser pulses

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The mechanisms of surface relief formation on bulk copper samples under the influence of laser pulses in the preablation mode are investigated. It has been experimentally established that a characteristic system of protrusions/depressions is formed on the surface of samples in local areas near grain boundaries. Molecular dynamic modeling has shown that the main physical reason for the development of the considered relief is the anisotropy of thermal expansion of variously oriented grains (crystallites) during cyclic heating to pre-melting temperatures. It is established that thermomechanical stresses arising in the subsurface layer exceed the yield strength of the material, which leads to irreversible plastic deformation. [1]

[1] Nelasov I V, Manokhin S S, Kolobov Y R, Zhakhovskii V V, Perov E A, Petrov Y V, Khomich Y V, Malinskii T V, Inogamov N A and Rogalin V E *ZhETF* **167**(6) 782–797 (rus) URL `http://jetp.ras.ru/cgi-bin/r/index/r/167/6/p782?a=list`