

Relief formation on copper polycrystal by laser thermal cycling

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Cyclic exposure to laser pulses with fluences below the melting threshold leads to formation of a relief on the metal surfaces [1]. The danger of this phenomenon lies in the deterioration of optical characteristics of metal mirrors used in high-power lasers [2]. Molecular dynamics simulation allows us to elucidate that the different elastic-plastic response of crystalline grains is responsible for the growth of relief. It is found that the shear stresses required for plasticity are generated by anisotropic thermal expansion of neighbor grains having different lattice orientations. The effective yield strength of material increases after each heating-cooling cycle due to irreversible plastic deformations in a subsurface layer, and thus the relief growth stops after several cycles.

[1] Malinskiy T, Mikolutskiy S, Rogalin V and et al 2020 *Tech. Phys. Lett.* **46** 831–834

[2] Kaplunov I and Rogalin V 2013 *Izvestiya Sochi State University* 120–127