Regularities and mechanisms of copper surface relief formation under pulsed laser action.

Nelasov I.V[1,@], **Manokhin S.S.**[1], **Kolobov Yu.R.**[1], **Zhakhovsky V.V.**[2], **Perov E.A.**[3], **Khomich Yu.V.**[4], **Inogamov N.A.**[3,5], **Malinsky T.V.**[4] **and Rogalin V.E.**[4]

[1] Federal Research Center of Problems of Chemical Physics and Medicinal Chemistry of the Russian Academy of Sciences, Academician Semenov Avenue 1, Chernogolovka, 142432,
[2] Dukhov Research Institute of Automatics (VNIIA), Sushchevskaya 22, Moscow, 127055, None
[3] Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow, 125412, Russia
[4] Institute for Electrophysics and Electrical Power of the Russian Academy of Sciences, Dvortsovaya Naberezhnaya 18, Saint-Petersburg, 191186, None
[5] Landau Institute for Theoretical Physics of the Russian Academy of Sciences, Akademika Semenova 1a, Chernogolovka, 142432, None

[@] nelasov@icp.ac.ru

An experimental study and molecular dynamic (MD) modeling of the formation of surface relief (known as the optoplastic effect) and the microstructure of thin near-surface layers of copper after exposure to laser pulses of nanosecond duration with parameters corresponding to the absence of ablation have been carried out. The determining role of thermoplasticity, realized by the formation of deformation twins in the form of nanoscale plates, as well as dislocation walls of slip systems $\{111\}\langle 110\rangle$ and $\{111\}\langle 110\rangle$ common for the FCC lattice of copper, is established. The results of MD modeling are confirmed by experimental data, which allows validating the model for the processes in materials under laser exposure under the specified conditions.

[1] Malinsky T V, Rogalin V E and Yamshchikov V A 2022 *Physics of Metals and Metallography* **123** 192–199 [in Russian]
[2] Zhakhovsky V, Kolobov Y, Ashitkov S, Inogamov N, Nelasov I, Manokhin S, Khokhlov V, Ilnitsky D, Petrov Y, Ovchinnikov A, Chefonov O and Sitnikov D 2023 *Physics of Fluids* **35** 096104