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Shock–Induced Nanostructure Formation in Copper YURII MESHCHERIAKOV, NATALIA ZHIGACHEVA, ALEXANDRE DIVAKOV, GRIGORII KONOVALOV, Institute of Problems of Mechanical Engineering RAS, Saint-Petersburg, Russia, BORIS BARAKHTIN, CentralResearch Institute of Constructional Materials "Prometei" — Shock-induced nanostructure in polycrystalline copper of varied purity is found to be nucleated within narrow range of strain rates $5{\cdot}10^6 \div 5.7{\cdot}10^6 s^{-1}$. Shock loading of plane targets was conducted in two ways. The first way allows interference of longitudinal and lateral release waves whereas in the second configuration the studied material was conically pressed inside the copper disks, which allows to avoid a passage of lateral waves through the material of interest. The chaotically distributed within grains 3D-nanostructure formations of 15 $\div$ 25 μm in diameter are the result of dynamic response of material on combined loading with longitudinal and lateral release waves, which can be provided only in the first way of shock loading i.e. under 3D conditions. The formations consist of 3D-network of mutual perpendicular microtwins of 100$\div$200 *nm* spacing. Energy and momentum expended on formation of the structures is shown to be quantitatively characterized by "defect of particle velocity" - difference between impact velocity under symmetrical collision and free surface velocity. There is a threshold strain rate at which defect of particle velocity begins to grow very fast, dimension of formations increases, and simultaneously hardness and spall-strength of material grow as well.

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