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Shock-induced turbulence and dissipative structures in $copper^{1}$ YURI MESHCHERYAKOV, NATALI ZHIGACHEVA, ALEXANDRE DIVAKOV, INAN MAKAREVICH, Institute of Problems of Mechanical Engineering, Russian Academy of Sciences, BORIS BARAKHTIN, Central Research Institute of Constructional Materials "Prometey" — A shock-wave loading under uniaxial strain conditions of polycrystalline M3 copper reveals a threshold nucleation of dissipative structures of $15 \div 25 \ \mu m$ in diameter. Where observed the turbulent-like formations lie in the grains favorable oriented respectively shock wave propagation direction. Each structure consists of networks of parallel or mutual perpendicular shear bands of $100 \div 300 \ nm$ spacing, so the size of elementary cell restricted by shear bands in their scale belong to nanostructure. Macroscopically, momentum and energy expended on formation of the structures is quantitatively characterized by "deficit of particle velocity" - difference between impact velocity under symmetrical collision and free surface velocity of shock loaded plane target. There is a threshold strain rate higher which the deficit of particle velocity begins to grow very fast and simultaneously the hardness and spall-strength of material grow in the same manner.

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