Abstract Submitted
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Turbulence and 3D-Dynamic Structures in Shock Deformed Copper[1] YURY MESHCHERYAKOV, ALEXANDRE DIVAKOV, NATALIA ZHIGACHEVA, IVAN MAKAREVICH, BORIS BARAKHTIN, Institute for Problems of the Mechanicle Engineering RAS, PHYSICS OF FRACTURE LAB TEAM — Shock loading of polycrystalline copper under uniaxial strain conditions at 6.2÷7.3 GPa results in nucleating 3D-dissipative structures of 5÷25 μm in diameter. Interior of structures is a network of microtwins of 100÷300 nm spacing. 3D-structures are thought to be a results of visualization of large-scale turbulence in the structure-unstable material. Nucleation of structures occurs at the impact velocity where particle velocity variation begins to grow faster than mean particle velocity or when local strain rate at the mesoscale becomes higher than macroscopic strain rate. Simultaneously, defect of particle velocity at the plateau of compressive pulse, hardness and spall-strength grow in the same manner. Repeated loading results in increase of Hugoniot elastic limit by 15÷20 times and decrease of plastic front slope. Physically, nucleation of dissipative structures is initiated under resonance conditions between period of polarized dislocation structure and plastic front rise-time.

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