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Threshold for dynamic re-crystallization in shock loaded aluminum alloy YURY MESHCHERYAKOV, A.K. DIVAKOV, N.I. ZHIGACHEVA, I.P. MAKAREVICH, B.K. BARAKHTIN, Institute for Problems in Mechanical Engineering RAS — Shock loading of D16 aluminum alloy within impact velocity range of 30-450 m/s reveals two regimes of dynamic deformation. Three dynamic variables – particle velocity U_p, particle velocity dispersion D^2 and velocity deficit at the plateau of compressive pulse ΔU are registered in real time at every shock. At the impact velocities lower 380 m/s, velocity deficit (which quantitatively characterizes an intensity of meso-macro energy exchange) is very small or absent at all. In this region of impact velocities the structure of material remains invariable. At 380 m/s a catastrophical growth of velocity deficit occurs, which corresponds to start of dynamic re-crystallization process as adaptation mechanism to loss of structural stability of dynamically deformed material. The size of grains decreases from 30 μm to 1,5 -2 μm. The catastrophical growth of velocity deficit happens when rate of change of velocity dispersion becomes higher than rate of change of mean particle velocity, i.e. a criterion$\left(\frac{D}{u}\frac{\dot{D}}{\dot{u}}\right) \geq 1$ is fulfilled.

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