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A Brief Review on Plastic Deformation Mechanisms in Nanotwinned Materials

N.V. Skiba

Institute for Problems in Mechanical Engineering, Russian Academy of Sciences, Bolshoi pr., V.O., 61, St. Petersburg 199178, Russia

Received: March 10, 2026 Corresponding author: N.V. Skiba

Abstract. A brief review of the theoretical models which describe mechanisms of the plastic deformation in bulk nanotwinned materials, nanotwinned films and bimodal composites with nanotwinned structure is presented. The first model considers the mechanism of the plastic deformation due to the stress-driven high-angle grain boundary migration which is accompanied by migration of twin boundaries in ultrafine-grained metals with nanotwinned structure. In the framework of the second model, the micromechanism of the plastic deformation in nanotwinned films is widening of nanoscale twins due to migration of twin boundaries. In the third model, the plastic deformation of bimodal composites occurs due to the lattice dislocation slip and the grain boundary sliding in nanocrystalline/ultrafine-grained matrix, and the lattice dislocation slip and the migration of the twin boundaries in large grains with nanotwinned structure.

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