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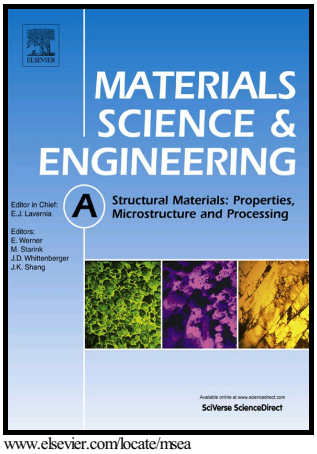

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Strengthening mechanisms and dislocation processes in <111> textured nanotwinned copper

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Abstract

We use molecular dynamics simulations to elucidate the deformation mechanisms of <111> textured nanotwinned materials under tensile loading parallel to the twin boundary (TB). Our simulations reveal that the tensile strength of nanotwinned Cu increases monotonically as the twin spacing decreases. The strengthening effect mainly results from TB restricting the transmission of dislocations across the TB. Throughout the simulations the transmissions of dislocations across the TBs dominate the plastic deformation. Both direct and indirect transmissions are identified at atomic level. Direct transmission involves either successive transmission of the leading and trailing partials as in the Fleischer cross-slip model or absorption