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Crystallographic orientation dependence of plastically stored energy in torsion-sheared samples of an IF steel grade

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Crystallographic orientation dependence of plastically stored energy in torsion-sheared samples of an interstitial free (IF) steel grade
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Abstract
Crystallographic orientation preference in metallic materials after plastic deformation is known as the result of dislocation glides and/or mechanical twinning. By applying crystal plasticity theory (i.e. fully constrained Taylor, visco-plastic self-consistent and advanced Lamel models), evolutions of deformation textures are predicted with reasonable accuracy. However, the formation of annealing textures in deformed materials has never been fully accounted for by any mean-field model calculations. One of the main reasons is that the driving force for recrystallization behaviors in materials has not yet been assessed exhaustively. In this study, plastically stored energy of deformed crystals in torsion-sheared samples of an interstitial-free (IF) steel grade is measured by EBSD and HE-XRD techniques. Experimental results have been analyzed and compared with the corresponding Taylor factor map of crystal plasticity theory. The study aims at a better understanding on the orientation dependence of stored energy in deformed crystals, as well as its influence on recrystallization behaviors of the materials after annealing.

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