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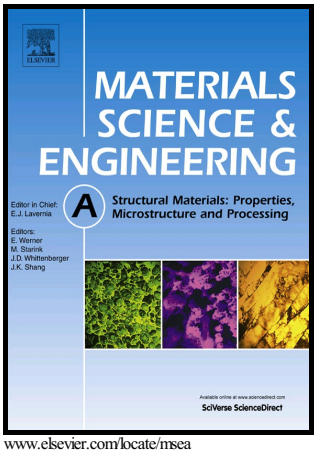

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Simultaneously improving the strength and ductility of Fe–22Mn–0.6C twinning-induced plasticity steel via nitrogen addition

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Abstract

The effect of nitrogen addition on the mechanical properties of Fe–22Mn–0.6C (wt.%) twinning-induced plasticity steel was studied. It was found that the stacking fault energies of the two steels were comparable, and the twinned grain fractions of FeMnC and FeMnC-N steels were similar before the true strain of 0.5. With increasing the strain to 0.7, the fraction of secondary twinned grain rose to support the further strong work-hardening rate of FeMnC-N steel. Moreover, the nitrogen addition suppressed the dynamic strain aging, which can trigger early shear fracture in FeMnC steel. Therefore, the work-hardening rate was kept increasing and the frequency of plastic instability was suppressed by nitrogen addition, and the ultimate tensile strength and uniform elongation simultaneously increased in FeMnC-N steel.

Keywords: Twinning-induced plasticity (TWIP) steel; Stacking fault energy; Deformation twin; Nitrogen; Dynamic strain aging.