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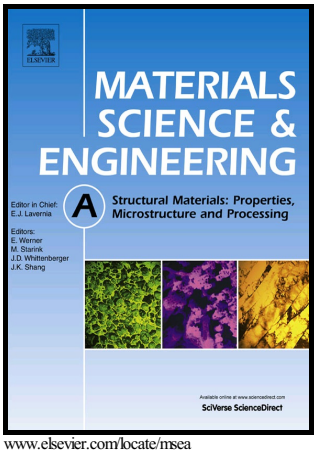

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Effects of intercritical annealing process on microstructures and tensile properties of cold-rolled 7Mn steel

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Abstract:

Influences of intercritical annealing temperature and duration on the microstructures and tensile properties of a newly designed medium Mn steel, Fe-7 wt.% Mn-0.3 wt.% C-2 wt.% Al, have been studied and discussed in this paper. Two types of cold-rolled ferritic microstructures, *i.e.* cell-like and lath-like, could transform to granular and lamellar austenite grains respectively during the subsequent intercritical annealing (IA). Both the IA temperature and duration strongly affect the fraction of retained austenite that have transformed during tensile deformation and the resultant tensile properties. In comparison with a Al-free 7Mn steel, it is found that the addition of Al has led to the reduced fraction but enhanced stability of RA grains; thus, they may transform gradually during deformation, which can make the maximum contribution to the sustainable work hardening. The developed steel exhibits the product of strength and plasticity up to 66GPa·%, which is much better than the Al-free 7Mn steel and almost one of the best tensile properties among the existing medium-Mn steels but with relatively lean alloying.

Key Words: medium Mn steel; TRIP effect; microstructure evolution; mechanical properties