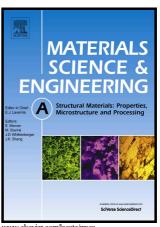
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Microstructure-Mechanical Property Relationship and Austenite Stability in Medium-Mn TRIP steels: The Effect of

Austenite-Reverted Transformation and Quenching-Tempering

Treatments

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Abstract

In the present study, we fundamentally explore the reasons underlying differences in mechanical properties in hot-rolled 0.2C-1.6Al-6.1Mn-Fe TRIP steels subjected to different heat treatments. Comparing with austenite reverted transformation annealing (ART) process, quenching and tempering (Q&T) process was effective in obtain excellent mechanical properties. [Q&T (UTS: 902-1235 MPa, TEL: 18-42%]; [ART (UTS: 885-945 MPa, TEL: 13-28%)]. In the ART process, long time annealing led to excessive C and Mn enrichment in austenite, which rendered austenite too stable and deteriorated TRIP effect. Furthermore, long time annealing reduced dislocation density and led to low work-hardening rate. The Q&T process enabled appropriate enrichment of elements and hence desired stability for significant TRIP effect to be observed. Thus, the steel quenched from 625 °C exhibited best combination of mechanical properties (UTS: 1038 MPa, TEL: 42%, UTS × TEL: 43.6 GPa%)

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