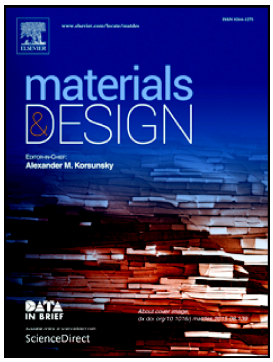

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PII: S0264-1275(18)30034-0
DOI: https://doi.org/10.1016/j.matdes.2018.01.026
Reference: JMADE 3629

To appear in: *Materials & Design*

Received date: 17 October 2017
Revised date: 10 January 2018
Accepted date: 12 January 2018

Please cite this article as: Xing Li, Liqing Chen, Yang Zhao, Raja Devesh Kumar Misra , Influence of manganese content on ϵ-/α′-martensitic transformation and tensile properties of low-C high-Mn TRIP steels. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jmade(2017), https://doi.org/10.1016/j.matdes.2018.01.026

Influence of manganese content on ε-/α′-martensitic transformation and tensile properties of low-C high-Mn TRIP steels

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Abstract

Low carbon steels containing 15−19 *wt*% Mn were processed to study the influence of Mn content on the thermally induced and deformation-induced ε-/α′-martensitic transformation and tensile properties of high-Mn TRIP steels. The stability of austenite and ε-martensite was studied in terms of thermodynamics, and work hardening behavior during tensile deformation was divided into two stages using Hollomon analysis. The results indicated that Mn increased the stability of austenite and ε-martensite and austenite grain refinement had a larger effect on $\gamma \rightarrow \varepsilon$ than $\gamma \rightarrow \alpha'$ transformation. During early stages of tensile deformation, the steel having ~15 *wt*% Mn continued the $\gamma \rightarrow \varepsilon$, $\varepsilon \rightarrow \alpha'$ and $\gamma \rightarrow \alpha'$ transformation because deformation energy compensated the Gibbs free energy required for phase transformation. But α′-martensitic transformation was difficult in steel having ~19 *wt*% Mn even after fracture