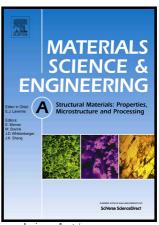
## Author's Accepted Manuscript

Micro and macro mechanical behavior of a transformation-induced plasticity steel developed by thermomechanical processing followed by quenching and partitioning

M. Karam-Abian, A. Zarei-Hanzaki, H.R. Abedi, S. Heshmati-Manesh



www.elsevier.com/locate/msea

PII: S0921-5093(15)30578-5

http://dx.doi.org/10.1016/j.msea.2015.10.116 DOI:

Reference: MSA32967

To appear in: Materials Science & Engineering A

Received date: 29 September 2015 Revised date: 28 October 2015 Accepted date: 29 October 2015

Cite this article as: M. Karam-Abian, A. Zarei-Hanzaki, H.R. Abedi and S Heshmati-Manesh, Micro and macro mechanical behavior of a transformation induced plasticity steel developed by thermomechanical processing followed by quenching and partitioning, *Materials* Science Engineering & http://dx.doi.org/10.1016/j.msea.2015.10.116

This is a PDF file of an unedited manuscript that has been accepted fo publication. As a service to our customers we are providing this early version o the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain CEPTED MANUSC

Micro and macro mechanical behavior of a transformation-induced plasticity

steel developed by thermomechanical processing followed by quenching and

partitioning

M. Karam-Abian <sup>a</sup>, A. Zarei-Hanzaki <sup>\* a</sup>, H. R. Abedi <sup>a</sup>, S. Heshmati-Manesh <sup>b</sup>

<sup>a</sup> The Complex Laboratory of Hot Deformation & Thermomechanical Processing of High Performance

Engineering Materials, School of Metallurgy and Materials Engineering, College of Engineering, University

of Tehran, Tehran, Iran

<sup>b</sup> School of Metallurgy and Materials Engineering, College of Engineering, University of Tehran, Tehran, Iran

**Abstract** 

A low-alloyed transformation induced plasticity steel was subjected to thermomechanical

processing (TMP) followed by quenching and partitioning treatment to achieve a desired

combination of the strength and ductility. The developed microstructures were precisely

analyzed, and the mechanical responses of individual micro-constituents were studied by

nanoindentation using a reliable scanning probe microscopy. The results indicate that the

characteristics of the constituent phases (i.e., the lath martensite, blocky fresh martensite and the

retained austenite) were dictated by the prior TMP. The occurrence of dynamic recrystallization

and the formation of equiaxed-shape fine austenite grains during TMP would provide fast

diffusion track for carbon to diffuse through the untransformed austenite. The carbon partitioning

from martensite to the surrounding austenite ensures the austenite stabilization and was identified

as the major factor for martensite softening at micro-scale level. The room temperature

mechanical properties were studied via shear punch and tensile testing methods. The obtained

superior mechanical properties, the ultimate tensile stress of ~1400MPa and shear elongation to

fracture of ~19% were justified considering the proper work hardening behavior of the material.

**Keywords:** Quenching and partitioning; Nanoindentation; Thermomechanical processing;

Mechanical properties; X-ray diffraction

\* Corresponding Author

Tel.: +98 21 61114167; Fax: +98 21 88006076.

## Download English Version:

## https://daneshyari.com/en/article/7975934

Download Persian Version:

https://daneshyari.com/article/7975934

<u>Daneshyari.com</u>