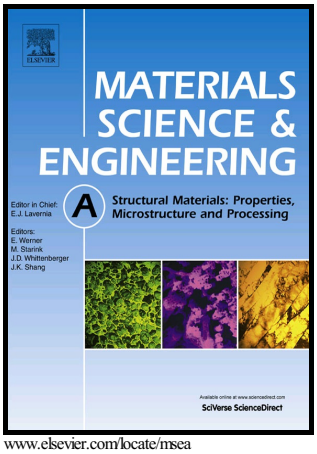
Significant enhancement of tensile properties through combination of severe plastic deformation and reverse transformation in an ultrafine/nano grain lath martensitic steel

H.R. Jafarian, Mohammad Falaki Tarazkouhi



www.elsevier.com/locate/msea

PII: S0921-5093(17)30042-4
DOI: http://dx.doi.org/10.1016/j.msea.2017.01.034
Reference: MSA34596

To appear in: *Materials Science & Engineering A*

Received date: 28 October 2016
Revised date: 9 January 2017
Accepted date: 10 January 2017

Cite this article as: H.R. Jafarian and Mohammad Falaki Tarazkouhi, Significan enhancement of tensile properties through combination of severe plasti deformation and reverse transformation in an ultrafine/nano grain lath martensiti s t e e l , *Materials Science & Engineering A* http://dx.doi.org/10.1016/j.msea.2017.01.034

Significant enhancement of tensile properties through combination of severe plastic deformation and reverse transformation in an ultrafine/nano grain lath martensitic steel

H. R. Jafarian*, Mohammad Falaki Tarazkouhi

School of Metallurgy and Materials Engineering, Iran University of Science and Technology (IUST), 16846-13114, Narmak, Tehran, Iran

*Corresponding author contacts: Tel: +98-21-77240540, Fax: +98-21-77240406. jafarian@iust.ac.ir

Abstract

In this paper, microstructural evolution together besides mechanical properties variation in a Fe-24Ni (wt.%) lath martensitic steel processed by accumulative roll bonding (ARB) and reverse transformation was investigated. The microstructural analysis indicated that after 6-cycle of the ARB process ultrafine/nano structure having mean grain size below 200 nm is obtained. Furthermore, the typical lath martensitic structure transformed to complicated microstructure consisting of ultrafine equiaxed ferrite as well as ultrafine grains of austenite. The results also showed that by increasing the number of ARB cycle martensite starting (M_s) temperature decreased. As well, tensile test results showed that both the yield strength and uniform tensile elongation improved considerably during the ARB process. Finally, increasing uniform elongation can be attributed to stabilization of austenite during the ARB process.

Keywords: lath martensitic steel; Nano-structure; Accumulative roll bonding (ARB); microstructure; Mechanical properties, reverse transformation.