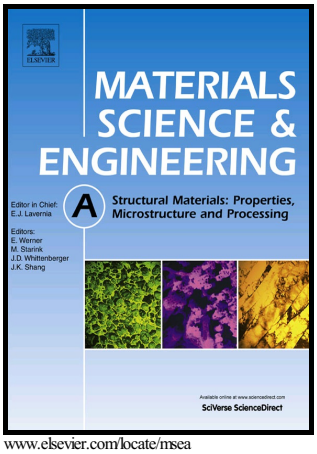
Enhancement of mechanical properties of low carbon dual phase steel via natural aging

Mehran Zamani, Hamed Mirzadeh, Mehdi Maleki



www.elsevier.com/locate/msea

PII: S0921-5093(18)31039-6
DOI: https://doi.org/10.1016/j.msea.2018.07.105
Reference: MSA36769

To appear in: *Materials Science & Engineering A*

Received date: 19 May 2018
Revised date: 28 July 2018
Accepted date: 30 July 2018

Cite this article as: Mehran Zamani, Hamed Mirzadeh and Mehdi Maleki, Enhancement of mechanical properties of low carbon dual phase steel via natural aging, *Materials Science & Engineering A*, https://doi.org/10.1016/j.msea.2018.07.105

Enhancement of mechanical properties of low carbon dual phase steel via natural aging

Mehran Zamani, **Hamed Mirzadeh**[1], **Mehdi Maleki**

Abstract

The natural aging behavior of a low carbon dual phase (DP) steel was studied and the effect of martensite content was taken into account. The enhancement of strength and hardness by aging at room temperature was related to quench aging via the formation of fine precipitates in the ferrite grains. It was revealed that increasing the intercritical annealing temperature diminishes this precipitation hardening effect, which was related to the decreased degree of supersaturation of carbon in ferrite. The maximum quench aging effect was observed by annealing the ferritic-pearlitic steel at a subcritical temperature close to the eutectoid temperature, where the solute carbon content of ferrite reaches the maximum value. However, in contrast to aged DP steels, the tensile stress-strain curves showed yield-point phenomenon. The aging effect was rationalized by the Ashby-Orowan relationship and the effect of the silicon in the chemical composition of the studied steel was discussed.

Keywords: DP steels; Quench aging; Mechanical properties; Precipitation.

[1] Corresponding author. Tel.: +982182084080; Fax: +982188006076. E-mail address: hmirzadeh@ut.ac.ir (H. Mirzadeh).

Affiliation of all authors: School of Metallurgy and Materials Engineering, College of Engineering, University of Tehran, P.O. Box 11155-4563, Tehran, Iran