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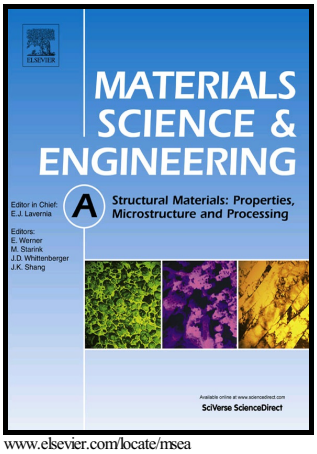

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Carbonitriding of low alloy steels : mechanical and metallurgical responses

W. Dal'Maz Silva[a,b,*], J. Dulcy[a,*], J. Ghanbaja[a], A. Redjaïmia[a], G. Michel[b], S. Thibault[c], T. Belmonte[a,**]

[a] *Institut Jean Lamour – UMR CNRS–Université de Lorraine 7198, Parc de Saurupt, Nancy 54011, France*
[b] *Institut de Recherche Technologique M2P, Metz 57070, France*
[c] *Safran Tech, Magny les Hameaux, France*

Abstract

Metallurgical and mechanical responses of alloys 16NiCrMo13 and 23MnCrMo5 to the addition of carbon and/or nitrogen were investigated. Diffusion profiles of these interstitial elements were established by atmospheric pressure carburizing, austenitic nitriding, and a sequence of carburizing and nitriding — the carbonitriding. All treatments were performed at 1173 K under $CO - H_2$ and/or NH_3 based atmospheres. After enrichment, each sample was (i) room-temperature oil-quenched and (ii) immersed in boiling nitrogen prior to (iii) the stress relief treatment. Cross-section hardness profiles were evaluated after each of these steps. Electron probe microanalysis (EPMA) allowed for the determination of both carbon and nitrogen diffusion profiles after quenching. In order to estimate the fraction of nitrides formed during the enrichment of the alloys, these measured profiles were employed in the simulation of local equilibrium at each evaluated position. This allowed for the computation of total solid solution interstitial content, which was expressed in atomic fraction. Plots of as-quenched hardness against the square root of the computed interstitial content, *i.e.* the

∗. Corresponding author
∗∗. Principal corresponding author
Email addresses: waltermateriais@me.com (W. Dal'Maz Silva), jacky.dulcy@univ-lorraine.fr (J. Dulcy), jaafar.ghanbaja@univ-lorraine.fr (J. Ghanbaja), abdelkrim.redjaimia@univ-lorraine.fr (A. Redjaïmia), gregory.michel@irt-m2p.fr (G. Michel), simon.thibault@safran.fr (S. Thibault), thierry.belmonte@univ-lorraine.fr (T. Belmonte)