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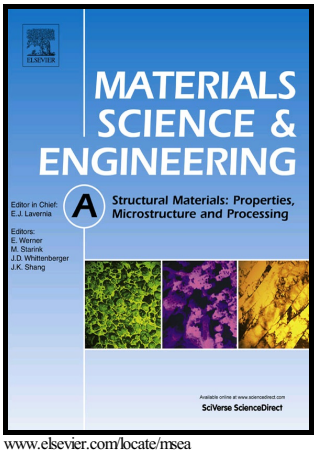

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PII: S0921-5093(17)30999-1
DOI: http://dx.doi.org/10.1016/j.msea.2017.07.094
Reference: MSA35342

To appear in: *Materials Science & Engineering A*

Received date: 28 May 2017
Revised date: 15 July 2017
Accepted date: 29 July 2017

Cite this article as: Sayed Ghafar Hashemi and B. Eghbali, Evolution of Hig Strength and Ductile Ultrafine grained Dual Phase Superferrite Low Carbon V Nb-Mo Steel, *Materials Science & Engineering A* http://dx.doi.org/10.1016/j.msea.2017.07.094

Evolution of High Strength and Ductile Ultrafine grained Dual Phase Superferrite Low Carbon V-Nb-Mo Steel

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Abstract

The microstructural characteristics of dual phase steels mainly determined by the starting microstructure before inter-critical annealing. In the present research, for the first time, the ultrafine grained dual-phase low carbon V-Nb-Mo steel processed by using severe warm rolling and subsequent inter-critical annealing of the super ferrite starting structure. The microstructure, texture, and tensile behavior of the processed steel studied by electron backscatter diffraction, scanning and transmission electron microscopy, nanoindentation and tensile test. The results show that the superferrite offers abundant homogeneous nucleation sites. That led to significant grain refinement and homogenous dispersion of microstructure constituents. The microstructure of the processed steel was composed of equiaxed ultrafine ferrite grains with average size 0.95 μm and ultrafine martensite blocks (0.65 μm). Main texture components were α and γ-fibers. The steel revealed the yield strength of 945 MPa, the tensile strength of 1400 MPa, and total elongation of 23 pct. Also, fracture analysis exhibited a ductile failure mode. The appropriate combination of strength-elongation and ductile fracture of the