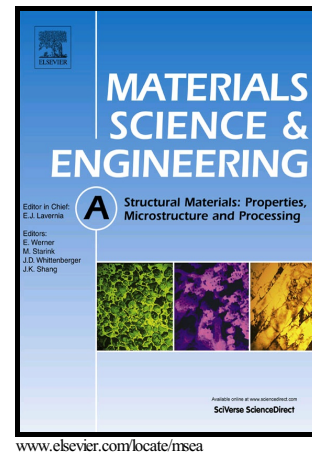


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Microstructural evidence of nano-carbides in medium carbon high silicon multiphase steels

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Abstract

High silicon steels containing 1.5-2 wt% silicon are considered to form carbide free bainite. However, the present work shows experimental evidence for the formation of nano-carbides in a series of medium carbon (0.61 wt%) high silicon (1.71 wt%) low alloy mixed phase steels with the help of transmission electron microscopy. The nano-carbide formation in bainite is attributed to the formation of inter-critical ferrite during continuous cooling, resulting in partitioning of carbon and silicon at the austenite-ferrite interface, leading to an increase in carbon and decrease in silicon at the austenite side of the interface. Due to diffusionless growth of supersaturated bainitic ferrite lath under para-equilibrium conditions, formation of bainite proceeds with higher carbon and lower silicon, allowing carbide formation in the bainite during subsequent holding at bainitic transformation temperature. Nano-carbides along with mixed phase microstructures are attributed to the excellent combination of high strength and high ductility in the present steels.

Keywords: *Mixed phase steel; Bainite; Carbides; Heat Treatment; TEM.*

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