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HEATTREATMENT EFFECT ON MICROALLOYED LOW CARBON STEEL WITH DIFFERENT BORON CONTENT

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ABSTRACT

The effect of different boron contents (between 3 and 70 ppm) on the metallurgical and mechanical properties of thermo mechanically carbon steel had been investigated. Three alloys were cast with different boron content. The alloys were subjected to thermo mechanical processing at temperature of 1200˚C and then quenched by air, oil or water as various quenching medium. Mechanical characteristics of those alloys were investigated through hardness and tensile tests at room temperature. Metallographic investigation was carried out using optical and scanning electron microscopes. Results revealed an improvement of the hot ductility of steels at increasing boron content. Ductility at 700, 900 and 1000 ^{o}C was higher than that at 800 ^{o}C, where boron microalloyed steels exhibit a region of ductility loss (hard region). Likewise, dynamic recrystallization only occurred at 900 and 1000 ^{o}C. The fracture surfaces of the tested steels showed ductile failure mode for all specimens except those with hard region the failure mode was ductile-brittle. Results are discussed in terms of dynamic recrystallization and boron segregation towards austenite grain boundaries, which may retard the formation of pro-eutectoid ferrite and increase grain boundary cohesion.

KEYWORDS: Boron Steel, Heat Treatment, Micro-Alloyed, Low Carbon Steel, Boron Effect, Metallurgical Properties, Mechanical Properties