International Congress on Materials & Structural Stability, Rabat, Morocco, 27-30 November

2013, Pages 0-0

Effects of Niobium and Molybdenum on Microstructures after Hardening and Wear Resistance of Austenitic Manganese Steel

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Abstract: Hadfield steel has been wildly used to manufacture railway crossings because of its excellent work hardening, high strength and toughness properties. The hardness of Hadfield steel is only about 20 HRC when subjected to water toughening. This low hardness is usually associated with poor wear resistance and severe plastic deformation, as well as abrasion of the working surface of the railway crossing during the initial service period, which remarkably reduces its service lifetime. In this study we focus on the influence of niobium and molybdenum on the phenomenon of surface hardening or work hardening and wear resistance. The transformation of austenite during operation, thus determines the steel operating lifetime, the rate of transformation of austenite to martensite can introduce a compromise between ductility and wear resistance of the steel to support large efforts without breaking. The objective of this study is to improve the wear resistance by abrasion and friction after heat treatment of manganese steel alloyed with niobium and molybdenum. The addition of niobium and molybdenum promotes secondary hardening and allows slower transformation of austenite during the heat treatment. The results showed that the introduction of niobium and molybdenum has strongly influenced the character of the structure crystallization before hardening (Part hardened) by precipitation carbides form and finesse variables is observed in the microstructure before heat treatment and complete dissolution is noted after heat treatment, for the hardened part (work hardening) we observed a greater thickness and hardness compared to the base steel and net improvement in wear resistance.

Keywords : Hadfield steel, Effects of Niobium and Molybdenum, Wear Resistance