

The Influence of Ni Elements on Mechanical Properties and Microstructure of Twinning Induced Plasticity (TWIP)

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Abstract : The influence of Ni elements on mechanical properties and microstructure of twinning induced plasticity (TWIP) steels were investigated in this study. TWIP 1 (0,6C, 24Mn) and TWIP 2 (0,6C, 24Mn, 1Ni) high Mn TWIP (Twinning Induced Plasticity) steels were fabricated, and were annealed at 700°C, 800°C and 900°C for 150 minute and then air-cooled. The microstructures and mechanical properties of specimens were analysed to investigate influence of Ni element on TWIP steel. The carbide precipitations have seen in microstructure of TWIP 1 and TWIP 2 specimen annealed at 700 °C. However, the microstructures of TWIP 1 annealed at 800°C and 900°C are fully austenite and some grains are including annealing twins. However twinning did not occur at TWIP 2 specimens annealed at 700 °C, 800 °C and 900 °C. TWIP 2 steel contains also Ni element differently from TWIP 1 steel. It can conclude that, Nickel (Ni) was restrained formation of twinning. The reversion of the tensile strength occurred between 700°C and 800°C because of the carbide precipitation hardening. Beside that, hardness value has decreased between 800 °C and 900 °C, which show a good agreement with the equilibrium dissolution temperature of M3C carbides. However, the results show that, carbide precipitations also are as strong barriers for the formation of twinning. For this reason, twinning was not obtained at 700 °C.

Keywords : high manganese, heat treatment, SEM, TWIP steel, cold rolling, nickel

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