

STRENGTHENING OF 13wt.%Cr-4wt.%Ni STAINLESS STEEL BY THERMAL CYCLING TREATMENT

Jai Singh¹, S. K. Nath²

¹ Centre of Nanotechnology, Indian Institute of Technology Roorkee, Roorkee-247667, India

² Department of Metallurgical and Materials Engineering, Indian Institute of Technology Roorkee, India

ABSTRACT

The as-received steel was treated by thermal cycling (TC) treatment using a thermomechanical simulator (Gleeble 3800). Each cycle of this treatment consists of heating to a temperature of 1000° C, holding for 6 minutes, and fast cooling. The microstructural characterization was done by using optical microscopy after conducting 6 cycles. The XRD study was performed to support the microstructural transformation. The microstructure of the treated sample consisted of a reduced amount of undesiring δ -ferrite as compared to the as-received steel. The strength deteriorating retained austenite was also disappeared from the evolved microstructure. Tensile properties were further utilized to characterize and compare the mechanical strength. A substantial rise in yield (YS) and ultimate tensile (UTS) strength along with a minor decrease in % elongation was observed in the treated steel. A 21.1% increase in the tensile toughness of the treated steel was observed. The improved strength due to the evolved microstructure after thermal cycling treatment was discussed.

Keywords: Stainless steel; Heat treatment; Microstructure; Yield strength, Tensile toughness.

