

Influence of Heat Treatment of 7Cr-0.93Mo-2.27W Steel on Mechanical Properties

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Abstract : Designed martensitic stainless steel was produced in a 30 kg induction furnace. The molten metal was cast into a refractory sand mold at 1600 °C. The produced ingots were reheated into the reheating furnace. Martensitic stainless steel was held for 1 hour at a temperature of 1150°C. The forging process starts and finishes at 1150 °C and 900 °C, respectively. A chemical analysis was carried out. Microstructure was studied. Heat treatment for martensitic stainless steel was carried out at 300 oC, 400 oC, 500 oC, 600 oC and 700 oC for 5 min, 20 min, 45 min, 120 min and 240 min. Hardness was measured after each heat treatment. The contribution influence of each time and temperature on hardness was investigated using factorial design for tempering temperature range (500 oC - 700 oC) for time up to 240 min. It was found that the microstructure is mainly a martensitic phase, and it conforms to the Schaeffler diagram. The results showed that time, temperature and their interaction combination have a negative effect on hardness in the temperature range (500 oC - 700 oC) with time range (5 min - 240 min). The model was built up in the form of coded variables and in actual variables. The predicted values - from coded and actual variables - of hardness are compatible with the experimental values. Factorial design is a useful technique to predict the effect and contribution effect of both time and temperature on the hardness of 7Cr-0.93Mo-2.27W martensitic stainless steel.

Keywords : steel, factorial design, hardness, heat treatment, temperature

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