

Effect of Aging Heat Treatment on Pitting Corrosion Resistance of Martensitic Stainless Steel^{*}

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Abstract

The aim of this work is to study the effect of the aging heat treatment on the pitting corrosion resistance of martensitic stainless steel. In this research a number of specimens from martensitic stainless steel were subjected to solution treatment at 1050 °C for one hour followed by water quenching then aging in the temperatures range (400-750) °C for different holding times (1-16 hrs). After heat treatment, two types of corrosion tests (accelerated test and immersion test) were conducted. The results obtained in this research showed that the pitting corrosion resistance was affected by Aging temperature and three critical temperatures were found in corrosion test: the specimens aged at 475 °C had maximum corrosion rate. This may be due to the presence of stringer δ -ferrite and precipitation of very fine precipitates which precipitated heterogeneously in the martensitic matrix, which led to an increase in corrosion rate. The specimens aged at temperatures range (550 – 625) °C had minimum values of corrosion rate, this is attributed to the high volume fraction of retained austenite. The specimens aged at temperatures above 625 °C had intermediate corrosion rate. The type of pits, which resulted from two pitting corrosion tests, was independent form the form of δ -ferrite and carbides which presence in microstructure.

Key words: martensitic stainless steel, aging, pitting corrosion, δ -ferrite, retained austenite

* For the paper in Arabic see pages (95-112)

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