Effect of Heat Treatments on the Electrochemical Behavior of 304L Stainless Steel in Nitric Acid

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doi: 10.20964/2017.04.50

Received: 19 December 2016 / *Accepted:* 18 February 2017 / *Published:* 12 March 2017

In this study, the intergranular corrosion behavior of 304L stainless steel (SS) after heating at different temperatures and times was investigated by using the double loop electrochemical potentiokinetic reactivation (DL-EPR), the potentiodynamic polarization electrochemical and the electrochemical impedance spectroscopy (EIS) methods. It was found that there was no significant difference in the potentiodynamic polarization curves of the specimens after different heat treatments. However, the corrosion resistance of specimens could be clearly distinguished by EIS. Between 650 to 750°C, the degree of sensitisation (DOS) had a maximum value and the decrease in R_{ct} was more prominent for the specimens aged at 650 and 750°C. Heat treatments conducted in the range of 650-750°C, even a brief heating time, caused a serious decline in the corrosion resistance of 304L SS. The R_{ct} -values of the specimens aged at 650 and 750°C decreased with the increase of the heating time. However, the R_{ct} -values of the specimens aged at 850°C increased with the increase of the heating time.

Keywords: Stainless steel; Intergranular corrosion; DL-EPR; EIS; Nitric acid

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