

NDT methods applied on corrosive behaviors of duplex stainless steel 2205 submitted to heat treatment and acidic medium

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Abstract : The present work investigates the corrosion behavior of 2205 duplex stainless steel in 3% HCl and 5% HCl solution after various heat-treatments. The stainless steels were heat-treated at 950° at 2h and 4h with air and water cooling. Each heat-treated sample was examined for their microstructures, before and after emerging the samples in the corrosive medium. The chemical composition and morphological structure of the stainless steel material are respectively characterized by X-ray fluorescence and optical microscopy. Electrochemical tests are carried out in three electrolytes system, the techniques used in this study are potentiometer open circuit (OCP) , linear polarization (LP) and electrochemical impedance spectroscopy (EIS) . The impedance spectra and the current - potential curves obtained allowed the estimation of the rate of corrosion in the various electrolytes and showed a variation in the polarization resistance (R_p) and the degradation kinetics of this material depending on the composition of the study environment. The Nondestructive evaluation is widely used to predict default in materials, the implantation of non destructive testing such as eddy current and hysteresis cycle, can give more information about the modification in structure. In the both solution, when we increase the emerging time for the two environment, we can observe a dissolution of the material, but the degradation is more important in the case of 5% HCl.

Keywords : duplex stainless steel, NDT, eddy current (DI), VSM, Hysteresis Loop, microstructure, Pitting corrosion, PREN, Electrochemical impedance spectroscopy .