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Influence of isothermal aging in LDX 2101 duplex stainless steel on the microstructure and local properties

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Abstract: In the present work, the interface morphology and the evolution of nitride precipitates in LDX 2101 stainless steel isothermally treated at 750 °C for various aging times were investigated. The microstructure results showed that the Cr2N nitrides precipitated along the ?/? interface with 200 nm in length and continue to grow to 2 ?m after 240 h of aging. However, only Cr2N nitrides were found at the ?/? interface after long term of aging. Atomic force microscopy (AFM) analysis revealed that Cr2N nitrides andCr23C6 carbides started to precipitate after the first 10 min of aging with a small needle shape of the former and specific triangular morphology of the latter. The evolution of hardness and Young's modulus of the interfaces, performed with nano-indentation measurements, showed that the ?/? interface became harder (4.1 ± 0.2 GPa) with increasing aging times, whereas negligible changes in the hardness and elastic modulus were recorded at the ?/? interface. 3D topographic analysis of the immersed surfaces revealed that the susceptibility of ? phase to preferential dissolution in 3.5% NaCl solution increased with aging time. This behavior was manifested by the important imperfections of ? phase, the high surface roughness (55.7 nm), and the deep corrosion pits (30 nm) along the ?/? interface and around the Cr2N nitrides.

Keywords : microstructure, Interface, precipitates, Nano-hardness, Surface degradation