

The Austenite Role in Duplex Stainless Steel Performance

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Abstract : Duplex stainless steels are attractive material for apparatus working with sea water, petroleum, refineries, chemical plants, vessels, and pipes operating at high temperatures and/or pressures. The role of austenite phase in duplex stainless steels performance was investigated. Zeron 100, stainless steels with 50/50 ferrite / austenite %, specimens were tested for strength, toughness, embrittlement susceptibility, and assisted environmental cracking (AEC) resistance. Specimens were heat treated at 475°C for different times and loaded to well- selected values of load. The load values were chosen to be within the range of higher / lower than the expected toughness. Sodium chloride solution 3.5wt% environment with polarity of -900mV / SCE was used to investigate the material susceptibility to (AEC). Results showed important effect of austenite on specimens overall mechanical properties. Strength was affected by the ductile nature of austenite phase leading to plastic deformation accommodated by austenite slip system. Austenite embrittlement, either by decomposition or nucleation and growth process, was not observed to take place during specimens heat treatment. Cracking due to (AEC) took place in the ferrite grains and avoided the austenite phase. Specimens showed the austenite to act as a crack arrestor during (AEC) of duplex stainless steels.

Keywords : austenite phase, mechanical properties, embrittlement susceptibility, duplex stainless steels

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