Effect of welding heat input on microstructure and residual stresses of duplex stainless steel weldments

N. OUALI, K. Khenfer, B. BELKESSA, B. Cheniti

Abstract: In the present investigation, the influence of heat input on microstructure, residual stresses and corrosion resistance of lean duplex stainless steel welds are discussed. The weldments were made with different heat inputs through changes in welding current and travel speed, using tungsten inert gas process. The microstructural evolution was characterized using optical and scanning electron microscopy, while the residual stresses were measured on surface and thickness by X-ray diffraction technique. The experimental results show significant changes in microstructure and ferrite content with a large fraction of reformed austenite. Samples exhibit compressive residual stresses on the weld surface. Potentiodynamic polarization tests evaluated in 3.5% NaCl solution exhibit high corrosion resistance of the weld metal produced with the low heat input.

Keywords: Lean duplex stainless steel, Welding TIG process, heat input, residual stresses, X-ray diffraction