

Microstructure and mechanical behavior in dissimilar 13Cr/2205 stainless steel welded pipes

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Abstract: This work aims to investigate the microstructure and the mechanical behavior of dissimilar 13Cr Supermartensitic/2205 Duplex stainless steel welded pipes. A wide variety of microstructures resulting from both solidification and solid state transformation is induced by the fusion welding process across the weld joint. The tensile tests show that the deformation process of the dissimilar weld joint is mainly controlled by the two base materials: the duplex steel at the beginning of the deformation and the supermartensitic one at its end. This is confirmed by the microtensile tests showing the overmatching effect of the weld metal. The fatigue tests conducted on dissimilar welded specimens led us to conclude that the weld metal is considered as a weak link of the weld joint in the high cycle fatigue regime. This is supported by its lower fatigue limit compared to the two base materials that exhibit a similar fatigue behavior.

Keywords : Dissimilar welding, microstructure, Tensile testing, High cycle fatigue