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Crack Initiation Assessment during Fracture of Heat Treated Duplex Stainless Steels

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Abstract : Duplex stainless steels (DSS) are widely employed in industry for apparatus working with sea water in petroleum, refineries and in chemical plants. Fracture of DSS takes place by cleavage of the ferrite phase and the austenite phase ductile tear off. Pop-in is an important feature takes place during fracture of DSS. The procedure of Pop-ins assessment plays an important role in fracture toughness studies. In present work, Zeron100 DSS specimens were heat treated at different temperatures, cooled and pulled to failure to assess the pop-ins criterion in crack initiation prediction. The outcome results were compared to the British Standard (BS 7448) and the ASTEM standard (E1290) for Crack-Tip Opening Displacement (CTOD) fracture toughness measurement. Pop-in took place during specimens loading specially for those specimens heat treated at higher temperatures. The standard BS7448 was followed to check specimen validity for fractured toughness assessment by direct determination of KIC. In most cases, specimens were invalid for KIC measurement. The two procedures were equivalent only when single pop-ins were assessed. A considerable contrast in fracture toughness value between was observed where multiple pop-ins were assessed.

Keywords : fracture toughness, stainless steels, pop ins, crack assessment
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