Multi-scale evaluation of crevice corrosion behavior in two lean duplex stainless steels: from initiation to propagation

Donghua Suo, Yangting Sun, Jin Li, Yiming Jiang*

Department of Materials Science, Fudan University, Shanghai 200438, P.R.China

20110300031@fudan.edu.cn

Abstract This article comprehensively employs a series of refined evaluation methods to deeply analyze crevice corrosion behavior and its differences between two duplex stainless steels, 2002 and 2101, which have comparable corrosion resistance. The results exhibit reversal crevice corrosion behavior of the two materials. DSS2002 has a lower critical condition, but DSS2101 exhibits a faster propagation rate. The article establishes the critical crevice corrosion temperature thresholds for DSS 2002 and DSS 2101 at 7-8 ℃and 9-10 ℃, respectively, by constructing Z-curves for both materials. The mechanism of metastable crevice corrosion induced by CaO inclusions in DSS2002 is clarified using visualization and statistical analysis. The mechanisms of micro-behavior and corrosion expansion dynamics in the active regions of the two DSSs are revealed through $FeCl_3$ immersion and bipolar electrochemical techniques. To comprehensively evaluate crevice corrosion resistance, it is necessary to assess both the initiation and propagation aspects of crevice corrosion.

Keywords Duplex stainless steel; Crevice corrosion; CaO inclusions; Bipolar electrochemistry; $FeCl_3$ immersion

Reference

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