

论文

304钢焊缝环境断裂行为的定量研究

王正,徐向俊,任晨星

郑州工业大学材料研究中心

摘要:

采用A002, A132和A302三种焊条以及(600, 800和1050)℃×6h 三种焊后热处理方式,研究了304钢不同焊缝的环境断裂行为。试验是用悬臂梁弯曲试样在室温0.5mol/L NaCl+2.5mol/L H2SO4溶液中进行的。测定了各种焊缝的da/dt~K1 曲线,并作了浸蚀试验\腐蚀电化学试验和断口分析。结果表明:焊缝的 K ISCC 为30~38MPam^{1/2},按A002,A302和A132顺序递增,只及母材的(62~79)%;其裂缝扩展速率da/dt达(5-7)×10⁻⁶mms⁻¹,为母材的2.8~3.9倍。随焊后热处理温度升高,da/dt下降,K ISCC 升高。304母材的环境断裂受应变产生活性通道机理控制;在焊缝中,铁素体呈阳极而优先溶解,其数量越多,越易呈半连续或连续的网状,意味着预存活性通道越通畅,环境断裂敏感性越高。焊缝成分和焊后热处理的影响,实际上都是通过改变铁素体的数量和形态而起作用的。

关键词: 304钢焊缝 环境断裂 门槛应力强度因子 裂缝

A QUANTITATIVE STUDY OF ENVIRONMENTAL FRACTURE BEHAVIOR FOR WELD METALS OF TYPE 304 STAINLESS STEEL

Zheng Wang,,

郑州工业大学材料研究中心

Abstract:

The environmental fracture behavior of 304 stainless steel base metal and three weld metals with different alloy additions(A002,A132 and A302)under as-welded and postweld heat treatment (PWHT) conditions were quantitatively studied in 0.5mol/L NaCl+2.5mol/L H2SO4 solution at room temperature.The tests were carried out with a cantilever bending test machine and the da/dt~K1 curves were determined to evaluate the resistance to environmental fracture.The micrography,fractography and electrochemical tests for corrosion were performed for mechanism study. The results showed that K ISCC of the weld metals was 30~39MPa m^{1/2},increasing in order of A002,A302and A132,being 62%~79% of the base metal,and their da/dt reached to (5~7)×10⁻⁶mms⁻¹,being 2.8~3.9 times of the base metal.As the PWHT temperature increased,the susceptibility to environmental fracture for the weld metals decreased.The environmental fracture behavior of 304 base metal was controlled by stress assisted active tunnels,showing transgranular(TG)fracture.However,the environmental fracture behavior of the weld metals were mainly controlled by pre-existing active tunnel mechanism.showing intergranular(IG)or IG+TGmode.Since the delta ferrite in the weld metals was an anodic phase to be preferentially corroded,forming pre-existent active tunnels,the resistance to environmental fracture decreased as the ferrite content increased and a continuous network formed.The environmental fracture behavior of 304 steel weld metals was mainly dependent on the ferrite content and morphology.Both the weld metal composition and PWHT would affect the resistance to environmental fracture through the change of microstructure.

Keywords: 304 steel weld metals environmental fracture threshold stress intensity crack growth rate pre-existe

收稿日期 1998-11-18 修回日期 1900-01-01 网络版发布日期 1999-10-25

DOI:

基金项目:

通讯作者: 王正

作者简介:

扩展功能

本文信息

Supporting info

PDF(277KB)

[HTML全文](1KB)

参考文献[PDF]

参考文献

服务与反馈

把本文推荐给朋友

加入我的书架

加入引用管理器

引用本文

Email Alert

文章反馈

浏览反馈信息

本文关键词相关文章

▶ 304钢焊缝

▶ 环境断裂

▶ 门槛应力强度因子

▶ 裂缝

本文作者相关文章

▶ 王正

▶ 徐向俊

▶ 任晨星