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研究论文

固溶氢对TA15钛合金电子束焊接头疲劳扩展寿命的影响

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**摘要:** 对TA15钛合金电子束焊接试样充氢,研究了氢对其显微组织形态和接头疲劳扩展寿命的影响。结果表明:充氢含量低于0.105%时,氢以固溶态存在于合金中,并未形成氢化物;母材抗疲劳扩展的能力高于焊缝区;随着充氢含量的增加,接头的疲劳寿命大幅下降。其原因是,微量氢的存在降低了TA15合金的韧性,固溶氢提高了疲劳裂纹的扩展速率。氢在边界处的聚集加速了焊接接头内裂纹沿马氏体束边界的扩展,导致在断口形成了“团结结构”这一特殊组织形态。

**关键词:** 金属材料 固溶氢 TA15 焊接接头 疲劳扩展寿命

Influences of Solution Hydrogen on the Fatigue Crack Propagation Lives of TA15 Alloys Electron Beam Welded Joints

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**Abstract:** The influences of hydrogen on microstructure and fatigue behaviors of electron beam welding TA15 alloys were investigated. No hydride formed when less than 0.105% hydrogen were charged in TA15 welded joints. The substrates have better fatigue cracking resistance than that of the welded joint; and small amounts of charged hydrogen resulted in great drop of fatigue crack propagation life, because the exsited hydrogen reduced the toughness remarkably of the TA15 alloy in the welded joint and increased the fatigue crack growth rates. The hydrogen accumulated along the boundaries accelerated crack propagation along the martensite packets in the welded joints, resulting in the formation of "colony structure" on the fracture surface.

**Keywords:** metallic materials solution hydrogen atom TA15 alloy welded joint fatigue propagation life

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