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论文

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TC11钛合金的组织及塑性与其断裂韧性及裂纹扩展速率的关系

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THE RELATIONSHIP OF MICROSTRUCTURE AND TENSILE DUCTILITY OF TCII TI-ALLOY WITH ITS FRACTURE TOUGHNESS AND CRACK PROPAGATION

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摘要

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摘要 研究了TCII合金的组织及拉伸塑性(ψ)与断裂韧性(K_{IC})及裂纹扩展(da/dN)的关系。指明: K_{IC} 及 da/dN 与 ψ 的关系取决于合金的组织类型。对片状组织及等轴组织进行了具体分析。

关键词: 钛合金 显微组织 拉伸塑性 断裂韧性 裂纹扩展速率

Abstract: The relationship of microstructure and tensile ductility (ψ) with fracture toughness (K_{IC}) and crack propagation (da/dN) of TC11 Ti alloy is researched into. The results show that the relation of K_{IC} and da/dN with ψ is dependent on structure type of alloy. For plate-like structure K_{IC} increases with increase of ψ , and then invariable. But for equiaxed structure with increase of ψ K_{IC} firstly increases, and then decreases, da/dN of plate-like structure changes along a curve with minimum, but for equiaxed structure da/dN is invariable with increase of ψ in the researched range up to 30% ψ K_{IC} of equiaxed structure increases with increase of thickness of a plate present in the transformed ft, cooling slowly through temperature range of 950–850°C during heat-treatment, many particles of Ti3Al will precipitate along the periphery of Widmanstätten platelets, resulting in serious decrease of ψ and K_{IC} . Optimum synthetic mechanical properties can be obtained by using the heat-treatment of 990°C, 80min, A.C. +950°C, 2h A.C. +530°C, 5h A.C. Maximum K_{IC} and minimum da/dN may be obtained by 1030°C, 80min, A.C. +850°C, 2h A.C. +530°C, 5h A.C., notwithstanding the ψ of alloy is very low (6.9%).

Keywords: titanium-alloy microstructure tensile ductility fracture toughness crack propagation

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