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焊后热处理对高强铝合金搅拌摩擦焊接头的影响

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摘要: 对航空用厚5 mm的7075铝合金搅拌摩擦焊试样热处理前后的焊缝微观组织及性能进行研究。结果表明: 当搅拌头旋转速度为600 r/min、焊接速度为60 mm/min时, 接头抗拉强度达到381 MPa, 是母材强度的84.6%; 焊核区由6-7 μm等轴晶组成; 经热处理后接头抗拉强度达到415 MPa; 硬度的最低处在前进侧热机影响区; 断口的微观形貌具有强化相的韧窝特征, 且断裂几乎发生在前进侧的热机影响区; 7075铝合金搅拌摩擦焊接头的薄弱点在热机影响区。

关键字: 7075铝合金; 搅拌摩擦焊; 微观组织

Effects of heat treatment after welding on friction stir welding joints of high-strength aluminum alloy

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Abstract: The microstructure and property before and after heat treatment of friction stir welded 5 mm aero 7075 aluminum alloy were investigated. The results show that when the rotating speed of stirring joint is 600 r/min and the welding speed is 60 mm/min, the tensile strength can reach 381 MPa that is 84.6% of the base metals, which are regarded as the most ideal parameters under experimental conditions. There are equiaxed grains with size of 6-7 μm in weld nugget. After heat treatment, the tensile strength can reach 415 MPa. The lowest hardness appears in thermomechanically affected zone (TMAZ) of advancing side. The fractography has a characteristic of dimples of strengthening phase and the strain fracture appears in TMAZ of advancing side of joints. The weak point of friction stir welding joint for 7075 aluminum alloy occurs in the TMAZ.

Key words: 7075 aluminum alloy; friction stir welding; microstructure

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