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TC4钛合金与LD10铝合金感应摩擦焊接头的组织与性能

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摘要: 利用感应电磁场对焊接过程热与物质流动作用, 改善异种金属摩擦焊接头的组织与性能。采用光学金相、扫描电镜及室温拉伸实验与对比分析的方法, 研究了外加电磁场对弱磁性材料TC4钛合金与LD10铝合金摩擦焊接头焊合区的显微组织、主要合金元素扩散行为及室温力学性能的影响。结果表明: 外加电磁场作用使TC4钛合金与LD10铝合金摩擦焊接头铝合金侧动态再结晶区宽度增大; 同时, 感应电磁场通过影响摩擦副合金材料内部电子密度状态等, 促进了摩擦焊接过程中主要合金元素Al和Ti在焊合区的扩散过程, 并且提高了TC4钛合金与LD10铝合金摩擦焊接头的拉伸强度。其中, 外加电磁场在顶锻保压阶段的影响更为明显。

关键字: TC4钛合金; LD10铝合金; 电磁场; 摩擦焊接; 显微组织

Microstructures and properties of induction friction welded joint of TC4 Ti alloy and LD10 Al alloy

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Abstract: By means of optical microscopy, EDX analysis and tensile test, the influence of the electromagnetic field on the microstructure characteristics, diffusion behavior and mechanical properties of friction welded joints between TC4 Ti alloy and LD10 Al alloy was explored. The results indicate that the width of dynamic recrystallization zone of friction welding joint between TC4 Ti alloy and LD10 Al alloy increases under the electromagnetic field. In addition, the diffusion zones of main alloying elements become wider, especially when the electromagnetic field is applied during the forging process. Meanwhile, the tensile strength of friction welding joint is improved obviously when the electromagnetic field is applied during the forging process of TC4 Ti alloy and LD10 Al alloy.

Key words: TC4 titanium alloy; LD10 aluminium alloy; electromagnetic field; friction welding; microstructure

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