

激光与光电子技术应用

V型坡口对钢/铝激光对接熔钎焊性能的影响

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摘要: 为了改善钢/铝熔钎焊中钎焊缝与钢一侧接合界面上冶金反应的不均匀性, 进而提高接头的拉伸强度, 采用仿真模拟及实验相结合的方法研究了V型坡口对钢/铝激光对接熔钎焊性能的影响。利用ANSYS软件对钢/铝激光对接熔钎焊温度场进行仿真, 在镀锌钢板上开设V型坡口时, 接合界面靠近上表面与靠近下表面的温度梯度(为241℃)较不开坡口时的温度梯度(为588℃)明显减小; 分别在镀锌钢板上开设V型坡口与不开坡口的钢/铝异种金属进行激光对接熔钎焊试验, 并对试样进行拉伸测试。结果表明, 在镀锌钢板上开设V型坡口的情况下, 接合界面上金属间化合物层的厚度分布较不开坡口均匀; V型坡口的存在使得断裂位置远离接合界面, 接头的机械性能明显改善。

关键词: 激光技术 激光焊接 金属间化合物 V型坡口 温度场 温度梯度

Effect of V-shaped grooves on properties of laser welding-brazed steel-aluminum butt joints

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Abstract: In order to improve the homogeneity of metallurgical reaction on the bonding interface between seam and steel so as to improve the tensile strength of a specimen, the effect of V-shaped grooves on properties of laser welding-brazing steel-aluminum butt joints was discussed by means of simulation combined with experiments. First, the temperature field of laser welding steel-aluminum butt was simulated by means of ANSYS. It was found that the temperature gradient on the bonding interface when there was a V-shaped groove on galvanized steel was lower than that when there was no grooves on galvanized steel. Then the experiments were carried out for laser welding steel-aluminum butt joints with and without V-shaped grooves on galvanized steel respectively, and the specimens were subjected to a tensile test. The result showed that distribution of intermetallic compounds on the bonding interface between the seam and galvanized steel with a V-shaped groove was more uniform than that without grooves. The V-shaped groove on the base material made the fracture far away from the bonding interface and the mechanical property of the joint was improved significantly.

Keywords: laser technique laser welding intermetallic compounds V-shaped groove temperature field temperature gradient

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