

激光与光电子技术应用

镁/铝异种金属激光焊气孔形成原因研究

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摘要: 为了研究镁/铝异种金属激光焊接焊缝气孔的形成原因,对1.8mm厚AZ91镁合金和1.2mm厚6016铝合金板材进行了激光搭接焊试验。利用场发射扫描电镜及自带能谱仪,对镁/铝异种金属焊缝中存在气孔缺陷的平均区域、内部不同区域、周围区域以及母材的微观形貌与元素的分布情况进行了研究。结果表明,元素蒸发烧损、残留母材表面的氧化膜以及母材中存在的原始微气孔是镁/铝异种金属激光焊气孔产生的主要原因;采用添加材料激光焊接技术抑制元素蒸发烧损,焊前清除镁板和铝板上下表面的氧化膜,消除镁合金板材原始氢微气孔,是防止镁/铝异种金属激光焊气孔缺陷产生的重要措施。该研究对获得低气孔率镁/铝焊接接头及提高焊接质量是有帮助的。

关键词: 激光技术 气孔 激光焊接 镁/铝异种金属

Study on the reason of porosity formation in laser welding of magnesium and aluminum dissimilar metal

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Abstract: In order to study the reason of porosity formation in laser welding of magnesium and aluminum dissimilar metal, AZ91 magnesium alloy in 1.8mm thick and 6016 aluminum alloy in 1.2mm thick were weld by means of laser lap welding. By using scanning electron microscope(SEM) and comes energy dispersive spectroscopy(EDS), the micro-morphology and element distribution of the average area, the interior region and the surrounding area of the porosity as well as the base material of magnesium and aluminum dissimilar metal weld was studied. The results show that the element evaporation burning, the oxide film remaining on the surface of the base material and the pre-existing micro-pores in the base material are the main sources of porosity in the laser welding of magnesium and aluminum dissimilar metal. Adding material to suppress element evaporated burning, cleaning the oxide film of the upper and lower surfaces of magnesium plates and aluminum plates before welding and eliminating the original hydrogen micro-pores in magnesium plate are the important measures to prevent the porosity formation in the laser welding of magnesium and aluminum dissimilar metal. The study is helpful to obtain low porosity ratio welded joints of Mg/Al and improve the welding quality.

Keywords: laser technique porosity laser welding magnesium and aluminum dissimilar metal

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