

### 论文摘要

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## 工艺参数对AZ31镁合金激光-MIG 复合焊缝成形的影响

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**摘 要:** 系统研究激光功率、电弧电流和热源间距对10 mm厚AZ31镁合金激光-MIG (Metal inert gas) 复合焊接工艺稳定性和焊缝成形的影响规律。结果表明: 实现最大激光-电弧协同效应的最优热源间距为3 mm; 复合焊接熔深决定于激光功率; MIG电弧电流对焊缝宽度有显著影响, 但是对焊接熔深影响有限; 在优化的工艺参数下, 激光-MIG复合焊接能够有效消除镁合金激光焊缝中存在的表面成形缺陷, 焊接速度提高50%; 与MIG焊接相比, 复合焊接熔深提高近10倍, 电弧燃烧和熔滴过渡稳定性大幅度提高; 因而激光-MIG复合焊接是镁合金焊接的一种有效方法。

**关键字:** 镁合金; 复合焊接; 激光焊接; 电弧焊接; 焊缝成形

## Effects of welding parameters on weld shape of laser-MIG hybrid welding of AZ31 magnesium alloy

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**Abstract:** Laser-MIG (Metal inert gas) hybrid welding with 10 mm thick AZ31 magnesium alloy was carried out and the effects of laser power, arc current and laser-arc distance on the weld shape were studied. The results show that the optimal laser-arc distance that has the maximum laser-arc synergic effect is 3 mm and the penetration depth of hybrid weld depends on the laser power. The arc current has an evident effect on the bead width but only a little influence on weld penetration depth. Under the optimal welding parameters, the laser-MIG hybrid welding can obtain good welds without morphological defect and the welding speed increases to 1.5 times as that of laser welding. Compared with MIG welding, the droplet

transfer of hybrid welding is more stable and the weld penetration depth increases to nearly 10 times. The study demonstrates that the laser-MIG hybrid welding is an effective welding process for magnesium alloy.

**Key words:** magnesium alloy; hybrid welding; laser welding; arc welding; weld shape

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