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Be/AlSi/Be激光焊接接头的显微组织

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摘要: 以AlSi合金为过渡材料, 运用激光焊接技术实现Be与Be的连接; 采用扫描电镜、纳米压痕仪及透射电镜对焊接接头的显微组织、剪切断面形貌及性能进行研究。结果表明: 熔合区和焊缝区组织由Be与AlSi合金形成的复合相构成, 焊缝区显微硬度和弹性模量分别为2 GPa和140 GPa, 熔合区宽度约10 μm ; 焊接接头剪切强度约为283 MPa, 剪切断面具有以准解理为主并伴有塑性的混合型断面特征, 熔合区附近热应力诱发的微裂纹、焊缝中的金属间化合物和气孔是导致焊接接头失效的主要原因。

关键字: 铍; 铝硅合金; 激光焊接; 微观组织

Microstructure of Be/AlSi/Be welding joint by laser

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Abstract: Using AlSi alloy as transition material, beryllium with beryllium was welded by laser. The microstructure and performance of the welding joint were studied by means of nanoindentation apparatus, scanning electron microscope (SEM), electron probe microanalysis (EPMA) and transmission electron microscope (TEM). The results indicate that the microstructure of weld and fusion zone for the Be/AlSi/Be laser welding joint is composed of compound phase formed by beryllium and AlSi alloy, and the microhardness and elastic modulus of welding zone are 2 GPa and 140 GPa. The concentration distributions of Al and Si show that the width of fusion zone is about 10 μm . The shear strength of Be/AlSi/Be welding joint is 283 MPa. The characteristic of shear fractographs is quasi-cleavage with local ductile dimples. According to the analysis for shear fractographs, the micro-crack made by welding thermal stress, intermetallic compounds and gas porosities formed in welding zone are the main cause leading to brittle rupture for welding joint.

Key words: beryllium; AlSi alloy; laser welding; microstructure

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