

碳纤维增强热塑性复合材料与金属的激光焊接研究进展

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摘要: 碳纤维增强热塑性复合材料 (CFRTP) 具有比强度高、耐腐蚀性好、抗疲劳性优异、可循环利用等优点, 在航空航天、新能源等领域中的应用不断增多, CFRTP 与金属之间的连接技术尤其是激光焊接技术的研究成为了重要关注的领域。本文首先介绍了 CFRTP 和金属间的激光焊接原理和研究的基本情况, 然后分别从实验与工艺参数、数值模拟、增强机理和方法三个方面, 依次详细综述了近年来国内外 CFRTP 与铝合金、钢、钛合金激光焊接的研究成果, 最后对 CFRTP 与金属的激光焊接研究进行了总结和展望。

关键词: 碳纤维增强热塑性复合材料; 激光热导焊; 数值模拟; 增强机理

Advances in laser welding of carbon fiber reinforced thermoplastic composites to metals

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Abstract: With the advantages of high specific strength, good corrosion resistance, excellent fatigue resistance, and recyclability, carbon fiber reinforced thermoplastic composites (CFRTP) are increasingly used in aerospace, new energy and other fields, and the research on the connection technology between CFRTP and metals, especially laser welding technology, has become an important area of concern. This paper first introduces the principle of laser joining of CFRTP to metals and the basic research situation, and then addresses extensively the research results of laser welding between CFRTP and aluminum, steel, titanium alloys at home and abroad in recent years, respectively from three aspects: the experimental and process parameters, numerical simulation, enhancement mechanisms and methods. Finally, the research on laser welding of CFRTP to metals is summarized and prospected.

Keywords: Carbon fiber reinforced thermoplastic composites; Laser thermal conduction welding; Numerical simulation; Reinforcement mechanism

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