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PROCEEDINGS

Effect of Energy Coupling Mechanism on Molten Pool Stability During Fiber-Diode Hybrid Laser Welding of 2195 Al-Li Alloy

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ABSTRACT

The violent interaction between the high-energy laser beam and the 2195 Al-Li alloy dramatically disturbs the fluctuation behavior of the molten pool during welding process, which results in the poor forming quality and severe porosity defects. In this paper, an emerging coaxial hybrid heat source consisting of a 1080nm fiber laser and a 915nm diode laser is employed in the welding of 2195 Al-Li alloy in order to obtain the more stable molten pool. The distribution characteristics of the fiber-diode laser beam intensity were researched to reveal the energy coupling mechanism. The is-situ observation experiment of inner keyhole morphology by utilizing the "sandwich" structure of 2195 Al–Li alloy and refractory glass was conducted to explore the effect of hybrid heat source on molten pool and keyhole stability. It is found that the fiber-diode laser hybrid welding process presents the larger keyhole entrance, the wider injection channel of plasma plume, compared to the single fiber laser welding process. The plasma plume area and keyhole depth are gradually increased with the higher fiber laser power and diode laser power.

KEYWORDS

Fiber-diode hybrid laser welding; 2195 Al-Li alloy; molten pool; keyhole

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