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PROCEEDINGS

The Influence of Leading Mode on the Stability of Plasma and Molten Pool in the Laser-MIG Hybrid Welding Process of Invar Alloy

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ABSTRACT

Invar alloy is widely used in the field of aeronautical composite die manufacturing because it has a very low coefficient of thermal expansion, which is like that of composite material. The laser-MIG (Metal-Inert Gas) hybrid welding was developed to join 10 mm thick Invar alloy plates using Invar M93 filling wire. High speed camera equipment was used to observe plasma dynamic processes. Three-dimensional finite element models of laser-MIG hybrid welding process were established to solve the flow field of the molten pool by two leading modes. Elaborated on the flow behavior of the molten pool and the evolution mechanism of plasma under two leading modes. The results show that the MIG plasma under MIG leading mode contracts more and deviates towards the keyhole, which is mainly related to the degree of ionization of the metal vapor. The keyhole is deeper and more stable under MIG leading mode, while the keyhole fluctuates more significantly under laser leading mode. In addition, the simulation results are in good agreement with the experimental results. The state of microstructure verifies the interaction state between laser and MIG under two leading modes.

KEYWORDS

Invar alloy; laser-MIG hybrid welding; plasma; keyhole; molten pool

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