



Experimental research on plasma plume and keyhole behaviour in laser deep-penetration welding of TC4

Jiajun Xu

Huazhong University of Science and Technology, China

Abstract:

Through laser welding experiment using high speed camera, the dynamics of plasma plume and keyhole could be observed simultaneously due to two image output modes of the camera. One showed the plasma plume and the other showed the keyhole. The keyhole area, plasma area and angle was extracted by image processing. To improve accuracy, a modified image processing algorithm named multiple binarization algorithm was proposed. It was found the areas of keyhole and plasma varied with changes in welding speeds and laser powers. Increased energy density led to an increase in their areas and a decrease in their stability. In addition, the plasma angle decreased with the decreased speed and has no relationship with the power.

Biography:

Jiajun Xu is a PhD from the State Key Laboratory of Digital Manufacturing Equipment and Technology, Huazhong University of Science and Technology, China. He has published more than 10 papers about dynamic behaviour mechanism, deformation and residual stress prediction of laser welding.

Recent Publications:

- Inhomogeneous thermal-mechanical analysis of 316L butt joint in laser welding July 2019 Optics & Laser Technology 115:71-80.



- Magnetic-Field-Induced Partial-to-Full Penetration Evolution and Its Mechanism During Laser Welding April 2019 JOM: the journal of the Minerals, Metals & Materials Society.
- Laser penetration welding of ship steel EH36: A new heat source and application to predict residual stress considering martensite phase transformation September 2018 Marine Structures 61
- Residual stress modelling in laser welding marine steel EH36 considering a thermodynamics-based solid phase transformation August 2018 International Journal of Mechanical Sciences 146
- Experiment study and regression analysis of molten pool in laser welding July 2018 Optics & Laser Technology 108:534-541

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