

Abstract Guidelines

Typically, the abstract shall include the following information:

- Objective, problem under investigation, hypothesis, or research goal
- Description of research methods
- Summary of findings
- Statement of the significance of this research/implications for future research

The specifications for abstract preparation are listed in Table 1. Please find the templates in the next two pages.

Table 1. Abstract Specifications

Item				
Document type	Word 97/2003/2007/2010			
Paper Size	A4			
Margins	Top 21 mm, Bottom 21 mm, Left 21 mm, Right 21 mm			
Line Spacing	Exactly 13 pt, except for Title			
Typography	Font Name	Font Size (pt)	Alignment	Notes
Title	Times New Roman	14	Center	Bold ; Line spacing exactly 18pt
Authors	Times New Roman	11	Center	Spacing before 8 pt; Spacing after 8 pt
Affiliations	Cambria	8	Center	<i>Italic</i>
E-mail	Cambria	8	Center	<i>Italic</i>
Abstract	Times New Roman	10	Justified	Bold heading; Spacing before 8 pt; Spacing after 8 pt
Keywords	Times New Roman	10	Justified	Bold heading

Quantitative Analysis of Surface Flow Behavior of Molten Pool in Laser Welding Based on Particle Image Velocimetry

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Abstract: Flow behavior is one of the essential characteristics of the laser welding which dominate the formation of welding defects including undercut and porosity. Lack of quantitative evaluation method of such behavior restricts the further improvement of the quality of laser welding. A method for this quantitative analysis was tried by using PIVlab tool which based on particle image velocimetry algorithm, on the molten pool images captured by the high-speed camera image while particles were not used in the experiments which is usually used in PIV measurement. The results showed that the molten metal flows around the keyhole and two convection loops situates the rear of the molten pool. Peak velocity were found at the zone behind the keyhole and relative high velocity can be found at the zones along two sides of keyhole, which may be due to higher temperature and better fluidity at these zones caused by the eruption of plasma inside keyhole. The welding speed perpendicular to welding direction is approximately twice as the speed of along the welding direction which partly offsets by the forward movement of rear molten metal within the molten pool caused by fluid dynamic pressure. Vorticity distributions around the molten pool indicate that there are two large vortices, a vortex around the keyhole is induced by keyhole eruption; another one at the rear of molten pool is the result of confront between plasma eruption and the flow of liquid metal of rear molten pool.

Keywords: Laser Welding; Flow Behavior of Molten Pool; Particle Image Velocimetry; Quantitative Analysis

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Laser Wire Filling Welding of Thick Carbon Steel Plates in Butt Joint with Ultra-narrow-gap

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Abstract: Steel structures with thick-sections are very often met in huge and heavy equipment such as large container ships, power plants and heavy machineries. For its thick plates joining the traditional high efficient welding method is narrow gap arc welding. For further improvement of welding productivity and quality, laser welding methods are being considered worldwide to be applied for such structures with thick sections. Among them the laser wire welding is more suitable for high plate thickness. For laser wire multi-layer welding in form of one pass per layer of thick joints with ultra-narrow gap a stable welding process and a symmetric weld form are very important. In this paper, carbon steel thick butt joints with ultra-narrow-gap were welded in multi-layer by laser filler wire method. The welding process stability in relationship with main welding parameters was investigated through high speed photographing. The influence of the misalignment of laser spot and wire end on weld form was also studied. The experiment results show that the laser-wire distance and laser power have strong influence on process stability, especially the metal transfer; welding speed and wire feeding rate have less influence in comparatively. Based on that, butt weld joints of 35 mm ~ 70 mm thick steel plates without lack of fusion were obtained under optimized laser wire welding parameters.

Keywords: laser wire welding; ultra-narrow gap; thick plate; metal transfer; weld form

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