I / I　　　　　　　　MIG

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（　　　　　　　　　　　　　，　　　　100081）

：　　　　　　　DSP　　　　　　　M IG/ MAG　　　　，
　　I/ I　，　　　　　　　　　　　.　　　　　　　　，
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　　　　　.　　，　　　　　　　　　　　　.
　　　　　　，　　　　　　.

：　　MIG　；　　　　；
：TG434　　　　　：A　　　　　：0253－360X(2009)04－0005－03

沙德尚

0 序 言

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. (1)
，　　　　　　　.(2)
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　　　　、　.(3)
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　　　　　　　[1]，
，　　　　　.

　MIG/MAG　　，
　　.(1)
　[2].(2) U/ I　，

　　　　　　　　　[3].(3) I/ I
　　　　　　　.　(1)

(2)

(3)

I/ I

1 自适应电压控制 I/ I 模式的原理

I/ I　　U/ I
I/ I　　　MIG

$$U = R_\omega I + \rho_r l_s I + U_0 + R_a I + E_a l_a \quad (1)$$

: I 　　　　　　　; R_ω 　　　　　　　　　; ρ_r 　　　,
　　　　　　　; l_s 　　　　; U_0 　　　　;
R_a 　　　　; E_a 　　　　　　.

[4] ,

[5] .

$$M_R = C_1 I + C_2 \rho_r I^2 l_s \quad (2)$$

: C_1 　 C_2 　　　; I 　　　　　 l_s
　　.

　　　　l_s 　　　 l_{sl} 　　　,

$$M_{R1} = C_1 I_1 + C_2 \rho_r I_1^2 l_{s1} \quad (3)$$

: M_{R1} 　　　　　; I_1 　　　　 l_{sl}

$M_{R1} = M_{R2}$, 　(2) 　(3) 　,

MIG/MAG 　　　　,　　　　　1

$(t_1 \sim t_3)$

图 1　　　　　　　　　 I/ I

Fig. 1　Regulation principle of AVC I/ I control

　　　　　　　　　　　　　　　2　　　,

　　　　　　　, l_{as} 　　　　　,
l_{af}, 　　　　　　　,
$U_{peakref}$ 　　　　　　 U_{peakf}　,
　　　　　　　　　 U_{bref}

. K_2　 K_1

, τ 　　　　　　　, L
, S 　　　, A 　.
(1).
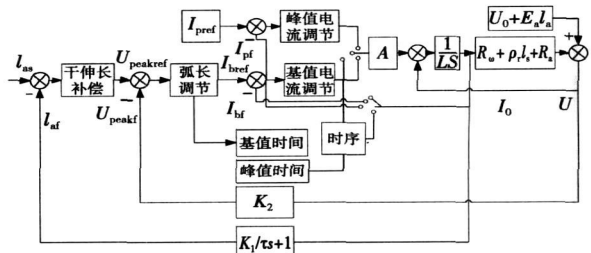
图 2　　　　　　　 I/ I
Fig. 2　Block diagram of AVC I/ I control

2　试验结果

TI　TMS320F2407
DSP 　,　　　　、
　　　PWM 　.
AVC I/ I

Synergic400
3 ～ 5 . 3 /
1.5 cm, 　　　　　7 m/min,
φ1.2 mm 　, 　　　　100% . 3a

3b

，　　　　　　．　　　　　　　，　　　　　　　　3.5 m/min，

3a　　3b　　，　　　　　　，　　　　　　　1.2 mm，　　　100% ，　　2.5 mm，

，　　　，　　　　　　　　　　　　　59 A　16.8 V.

，　　　　　　　　　　　　　　　5　　　　　　　　　　，

．　4　　　　　　，　　　，　　，　　　，

，　　4a　　　　　，　　4b　　　．

(a) 下台试验　　　　　　　　　　　(b) 升台试验

图 3　台阶试验电压和电流波形

Fig.3　Voltage and current waveforms of step experiment

(a) 整体焊接电压和电流波形　　　　　(b) 展开的焊接电压和电流波形
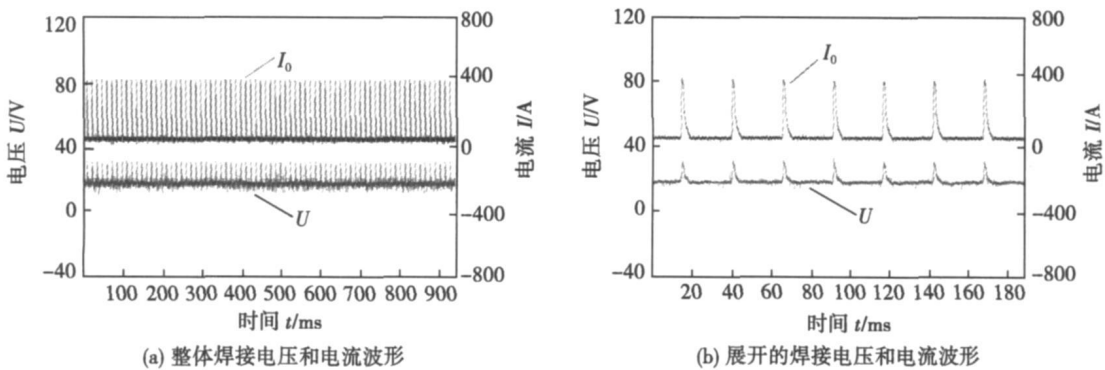
图 4　铝镁合金电弧电压和焊接电流波形

Fig.4　Voltage and current waveforms of aluminum alloy

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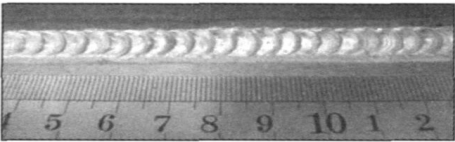
Fig.5　Appearance of aluminum alloys weldment

3　结　　论

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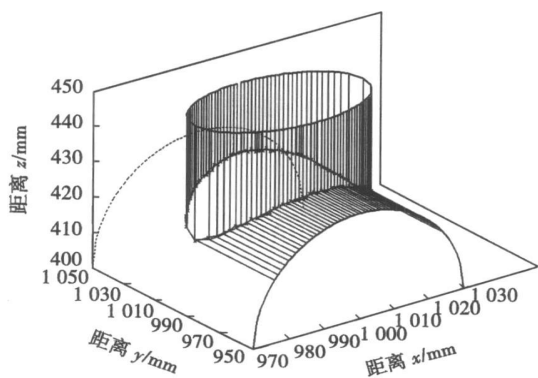
Fig. 8 Reconstruction of saddle-shaped seam

4 结　　论

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（3）　　　　　　　　　　　　　　　　　、
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（5）　　　　　　　　　　　　　　　　、
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MAIN TOPICS, ABSTRACTS & KEY WORDS

Study on microstructure of the coatings sprayed in low pressure condition and its post-treatment technology 　　　LI Deyuan, SONG Dan, ZHANG Zhongli, ZHAO Lingyan (School of Materials Science and Engineering, Shenyang University of Technology, Shenyang 110178, China). p1—4

Abstract: In order to make clear the effect of the spraying technology on the coatings microstructure formation in the low pressure spraying, the wires of 4Cr13, Al and Ti were adopted to prepare the spraying coatings in air and low pressure condition, respectively. The microstructure, the amount of the compounds and their distribution pattern in both coatings were compared by the micro-analysis and micro-area chemical analysis. Static press test was used to investigate the closing possibility of the porosities. After the press test, the coatings was heated to certain temperature to analyze the effect of the recrystallization heat treatment on the coatings microstructure. As a result, the amount of the oxide in 4Cr13 and Al coatings has been reduced obviously in the low pressure condition, and metallurgy combination between the splat particles can be formed by pressing and heating. However the low pressure condition can not provide sufficient protection for the Ti coatings, the following recrystallization heat treatment can not get metallurgy combination between the particles.

Key words: arc spraying; coatings; spraying particle; oxide; recrystallization

Full digital control of I/I mode pulsed MIG welding based on triple closed loop control 　　　SHA Deshang, Liao Xiaozhong (School of Automation, Beijing Institute of Technology, Beijing 100081, China). p5—7, 12

Abstract: This paper presents a full digital control strategy for pulsed MIG/MAG welding based on digital signal processor (DSP) control. One droplet per one pulse (ODPP) is maintained with the proposed control strategy which is characterized by I-I mode with adaptive voltage compensation (AVC). Welding database with different materials and diameters is established according to wire feed speed. Arc length is detected during each pulse period and the melting rate is changed. Moreover, real time compensation for the volt drop across the wire stickout is made to ensure the arc length constant while stickout changing. Operation principles are analyzed and control block diagram composed of triple closed loop is also presented. Experimental results show that the proposed method is feasible and universal. Constant arc length is realized when wire stickout changes. The welding process is stable and the welding bead is also good with the proposed method.

Key words: pulsed MIG welding; full digital control; arc length

Stereovision-based detection of 3-D weld seam using epipolar line constraint and laser stripe indication 　　　LI Hexi[1,2], WANG Guorong[1], SHI Yonghua[1], ZHANG Weimin[1] (1. College of Mechanical and Automotive Engineering, South China University of Technology, Guangzhou 510640, China; 2. College of Information Engineering, Wuyi University, Jiangmen 529020, Guangdong, China). p8—12

Abstract: An epipolar line constraint equation is established for a binocolar stereovision system mounted at the end-effector of welding robot. The stereovision correspondence technique based on the combination of epipolar line constraint with laser stripe indication is applied to detect the position of a three-dimensional (3-D) saddle-shaped weld seam which is produced by the intersection of two circular pipes. The experimental results show that the smooth segments of laser stripe in the weld seam image can be obtained using thinning and deburring arithmetics, and the stereovision correspondences between pairs of points at the left and the right images can be dependably realized by detecting both the singular points of laser stripe curvature and the intersecting points of laser stripe with epipolar line, thus, the detection accuracy to the 3-D weld seam and its adjacent area can be improved. The geometrical shape of the 3-D weld seam is reconstructed from the 3-D data acquired by stereovision-based detection with less errors compared with its actual dimension, therefore the proposed method can satisfy the detection reqirment of 3-D weld seam in automatic robot welding system.

Key words: stereovision; epipolar line constraint; laser stripe indication; correspondence; weld seam detection

Plasma component calculation in underwater wet welding 　　　LI Zhigang, ZHANG Hua, JIA Jianping (Institute of Mechatronics Engineering, Nanchang University, Nanchang 330031, China). p13—16

Abstract: The electric arc is formed in the ionized gas bubble in the underwater wet welding. Combined with the previous bubbles components determination, the main ionization and dissociation process in the bubble are analyzed. The calculation based on the potapov model was done for the underwater arc components at different water pressures and temperatures under the local thermodynamics equilibrium state. Its main theorical bases are the Dalton law of partial pressure, the law of mass action, the electric charge quasi-neutrality condition and the chemistry measurement equilibrium condition. The results show that with the pressure increasing from 0.101 3 MPa to 1.013 MPa and then to 10.13 MPa, the density of H, H^+, O, C, O^+, C^+ is increased, but the average ionization degree is not influenced by the water pressure.

Key words: underwater wet welding; electric arc; components calculation

Recognition and positioning of start welding position for arc welding robot 　　　CHEN Xizhang[1], CHEN Shanben[2] (1. School of Material Science and Engineering, Jiangsu University, Zhenjiang