Nd:YAG

t. *. **

Dissimilar Metal Welding of Inconel 600 and STS304 by a continuous wave Nd:YAG Laser

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Key Words: Laser welding(

), Dissimilar Metal(

), STS304, Inconel600

Abstract

Welding characteristics of STS304 stainless steel and Inconel 600 using a continuous wave Nd:YAG laser are experimentally investigated. Alloy 600 being used in steam generator tubing of pressurized water reactor(PWR) exposed to some corrosion environment, stress corrosion cracking can occur on this material. Presented here are the results from a series of experiments in which dissimilar metal welds were made using the gas tungsten arc welding process with pure argon shielding gas. But It is well known that solidification cracking susceptibility of austenitic alloys depends on the solidification temperature range and amount/distribution of solute rich liquid that exists at the terminal stages of solidification.

An experimental study was conducted to determine effects of welding parameters and to optimize those parameters that have the most influence on eliminating or reducing the extent welding zone formation at dissimilar metal welds.



, strain age cracking .(7~10) (phase) 가 가 Nd:YAG Inconel 600 STS304 (phase) (GTAW etc.) 가 가 가 가 가 2. 2 가 가 2.1 가 1064nm, 가 (multi-mode) CW Nd:YAG (4~6) 가 600µm Inconel 600 STS304 steel (Spot size) 0.6mm . F=200 mm 가 Inconel 600 F#(F number:F/D)7 3.33 (D) 60mm Ni-Cr-Fe

Nd:YAG 가

가 18%Cr 8%Ni 18-8 304 (STS304)

Inconel 600 STS304 HAZ 가 (HAZ) .

Inconel 가

STS304 Nd:YAG Inconel600 가 가 (Ar)



Fig. 1 Schematic diagram of the experimental setup

2.2.1

Bead on plate

Inconel

STS304

2.8kW

Fig. 1

Table T Mechanical & Physical properties of Materials								
	Tensile stress (N/mm ²)	Elongation (%)	Thermal conductivity (W/mK)	Melting point ('C	Density (Mg/m ³)	Thermal expansion	electric resistance	Hardness (HB)
Inconel 600	550	35~55	11.7	1395	8.47	13.3	103.0	220
STS 304	515	40	14.9	1400	8	-	-	210





	3mm	Ni
		600
STS304		

Table. 2 Table. 3

Table 2 Chemical component of Materials

	С	Si	Mn	Р	Ni	Cr	Fe	Cu
Inconel 600	0.01	0.1	0.3	0.3>	76	15.5	8	0.2
STS	0.08	1.00	2.00	0.04	8.0~	18~	60	
304	0.08	1.00	2.00	0.04	10.5	20	09	
가 100mm, 40mm								
(bead on plate)								
	(butt	weld	ling)					
sand paper(#220) (
40um) .								

가

(cold mounting) . #400, #800, sand paper #1000, #1200

suspension 6um, 1um (polishing) • HNO3, HCl,



3.1

기존의 연구방법은 레이저빔을 시편에 spot welding하여 spot size를 가지고 초점위치를 구하 여 Z=0으로 놓고 실험하였다. 그러나 초점위치와 작업거리의 차이는 분명히 차이가 있기 때문에 Bead on plate 방식을 선택하여 실험하였다.



Fig 2 The aspect ratio on the focus position



Fig 3 Welding Cross-section of the laser beam power(STS304, Inconel 600)



A-(×100)



Fig 4 Dissimilar metal Welding of the Cross-section by laser welding speed (Z=-1.0mm, P=1.4kW)



Fig 5 Photographs of fusion zones in laser welding power 1.4kW, and welding speed 1.6m/min

C-(×100)

D-(×200)

B-(×100)

. (HAZ) Ti , MC-type (HAZ) フト . (HAZ) フト フト フト

(GTAW, etc)

가 (microfissure)

 1.4kW,
 ブト -1.0mm

 1.0m/min
 ブト

 ブト
 ブト

4.

304		Inconel Nd:YA	600 AG
1)			· Bead on plate 가 가
Z=-1.0mm		가	
2)			1.0m/min,
-1.0mm			
1.4kW	가		
3)			
		가 1.0,	1.2, 1.4m/min
4)		1 4kW	7⊦ 1.0m/min
''		1.70.00,	가 .

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