

Fig.1 The newly developed system for the evaluation of solidification cracking

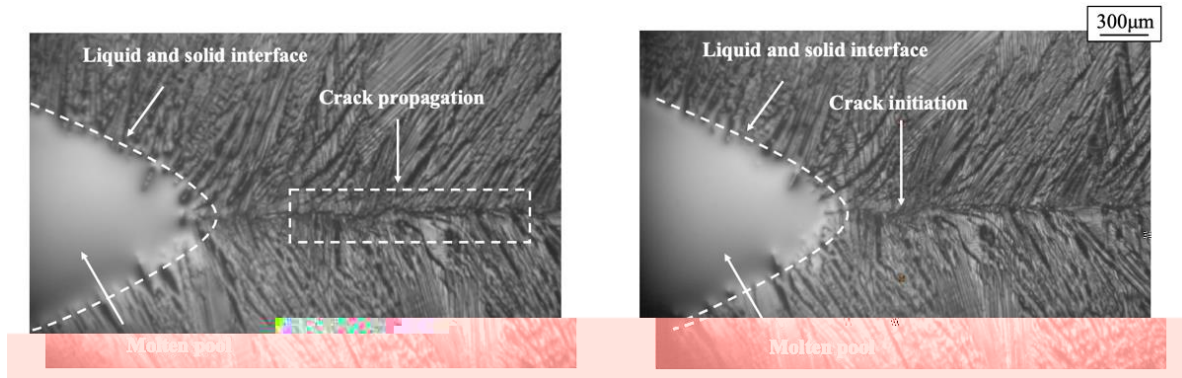


Fig.2 Images of Cracking process by high magnification in-situ observation

5.1 研究

TIG

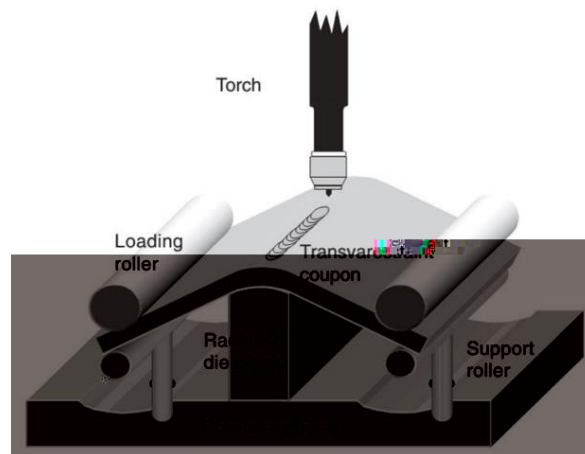


Fig.3 Schematic illustration of Trans-Varestraint test method

5.2 本研究

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5.3 実験条件

S50C

Table.1 Chemical compositions of used stainless steels (wt %)

Composition (wt %)

C	Si	Mn	P	S	Ni	Cr	Cu	Mo	V	Fe
0.5	0.216	0.673	0.020	0.016	0.04	0.102	0.075	0.012	0.002	Bal.

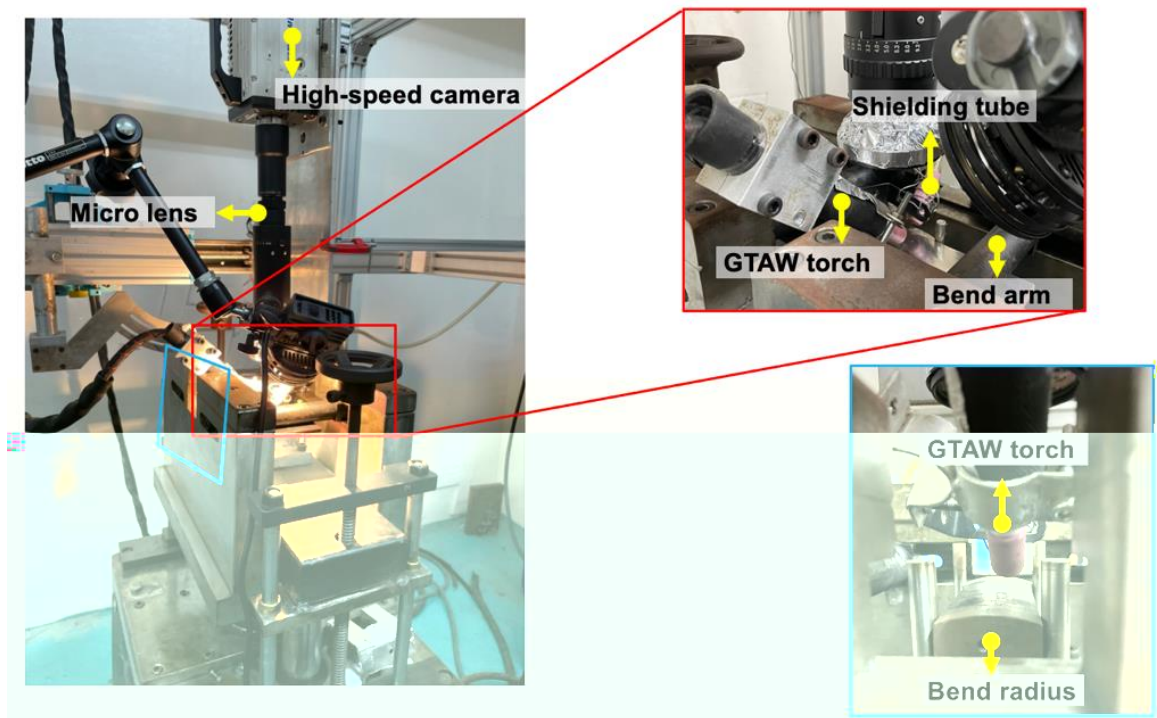


Fig.4 Experimental appearance

Table.2 Experimental conditions

Welding Current (A)	100 (DCEN)	Camera	High-speed camera (HX-7)
Arc Voltage (V)	22	Lighting	Metal halide
Welding speed (mm/s)	1.7	Lens	Micro-lens
Arc length (mm)	2	Shutter speed, sec	5k
Electrode diameter (mm)	2.4	Resolution	1280 × 960
Electrode extension length (mm)	10	Aperture grade	1
Shielding gas (Ar), (L/min)	15	Optical filter	Filter (960nm)
Ceramic cup (Number)	7	Frame rate, fps	500
Flow gas (L/min)	15	Camera to specimen, mm	85mm

5.4 実験結果

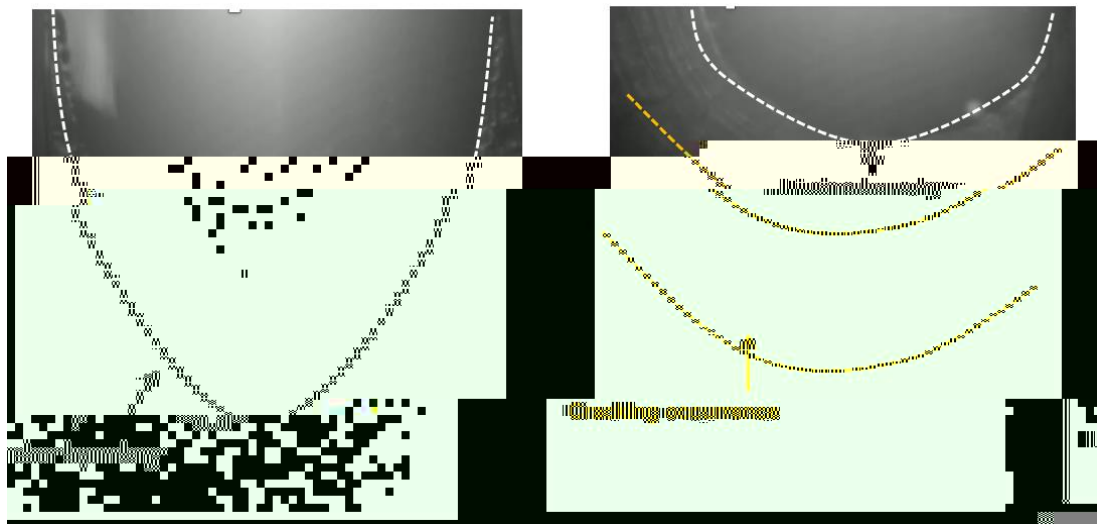


Fig.5 In-situ observation images before and after Trans-Varestraint test at welding speed of 1.7 mm/s under augmented strain of 4.8 %

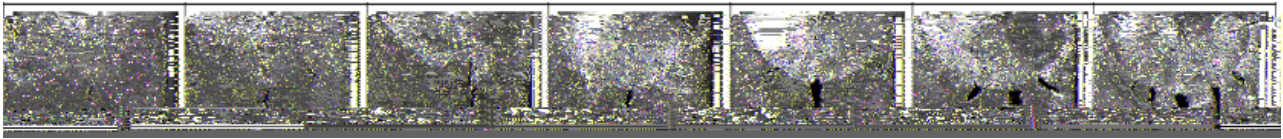


Fig.6 SEM images of the solidification cracking after Trans-Varestraint test at welding speed of 1.7 mm/s under various augmented strain from 0.7% to 4.8%

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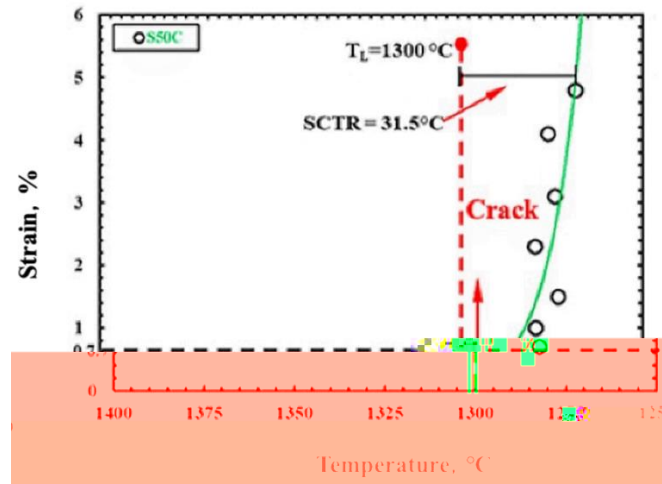


Fig.7 Solidification Cracking Temperature Range (SCTR) at welding speed of 1.7 mm/s after Trans-Varestraint test

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SCTR