

KAWASAKI STEEL TECHNICAL REPORT

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Development of High-Quality Narrow Gap Submerged Arc Welding Consumables for Cr-Mo Steel

Masaaki Tokuhisa, Yukio Hirai, Noboru Nishiyama, Itaru Yamashita, Kaname Nishio, Katsuaki Nakatsuji

Synopsis :

In a narrow gap arc welding process with a single-pass-per-layer technique, the toughness of weld metal greatly depends on that of as-dendrite structure. The increase in carbon content and V-addition have beneficial effects on improving the as-dendrite structure toughness by refining the bainitic lath sub-structure and increasing fine carbo-nitrides which have precipitated uniformly within the γ -grains after PWHT. Two types of narrow gap SAW consumables, i.e., the high C-V system for excellent-toughness Cr-Mo steels and high C-V-Ti system for enhanced-strength Cr-Mo steels have been developed on the basis of the above-mentioned metallurgical findings. The realization of a narrow-gap tandem SAW process was confirmed by a production scale mock-up test using the newly developed consumables.

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The body can be viewed from the next page.

Development of High-Quality Narrow Gap Submerged Arc

Welding Consumables for Cr-Mo Steel*

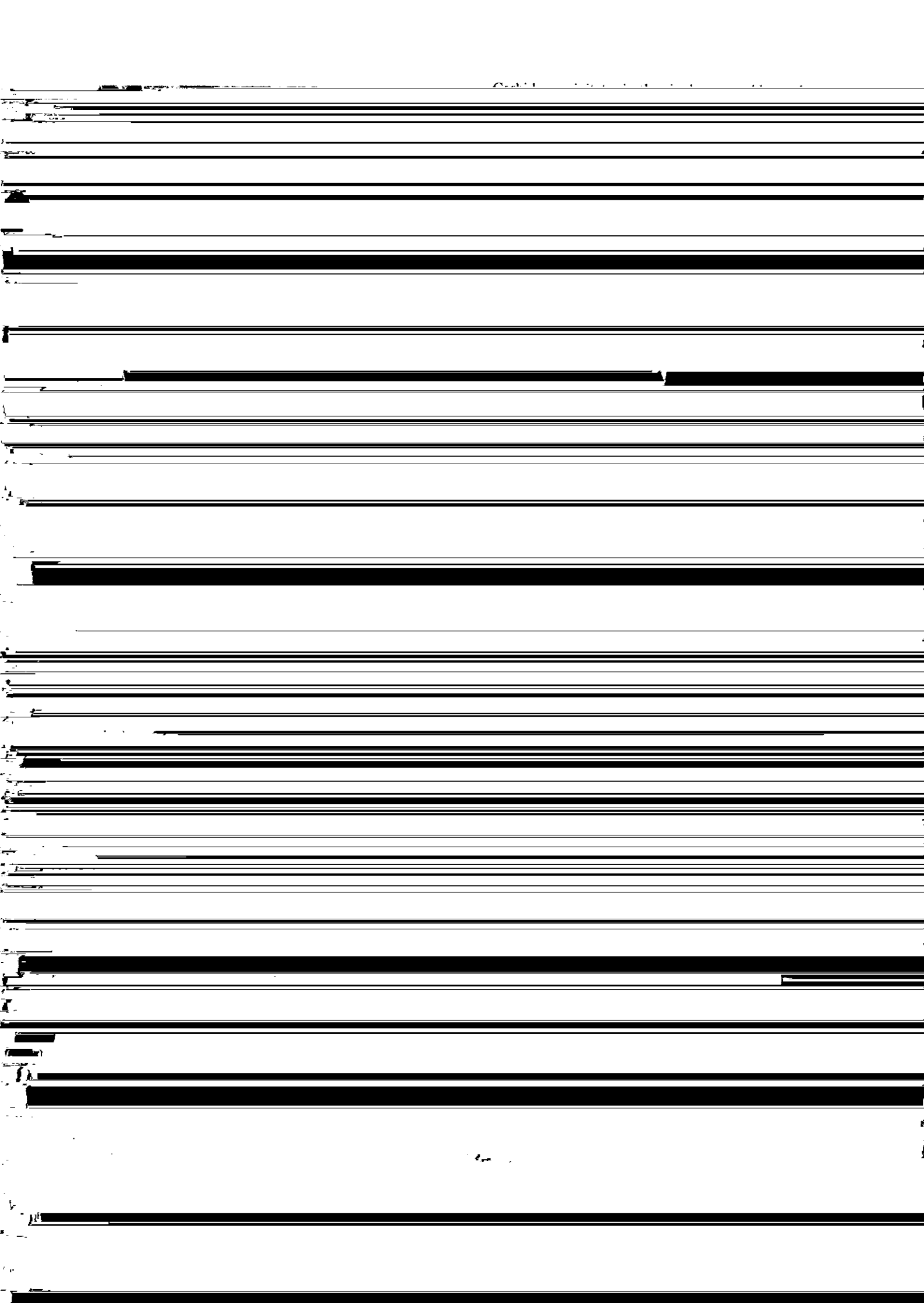


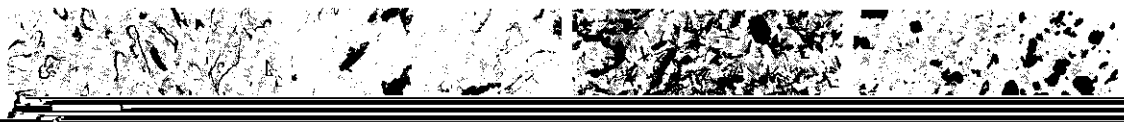
Synopsis:

In a narrow gap arc welding process with a single-pass-

C	Si	Mn	P	S	Cr	Mo
0.008	0.22	0.52	0.006	0.006	2.30	1.0

20





[REDACTED]

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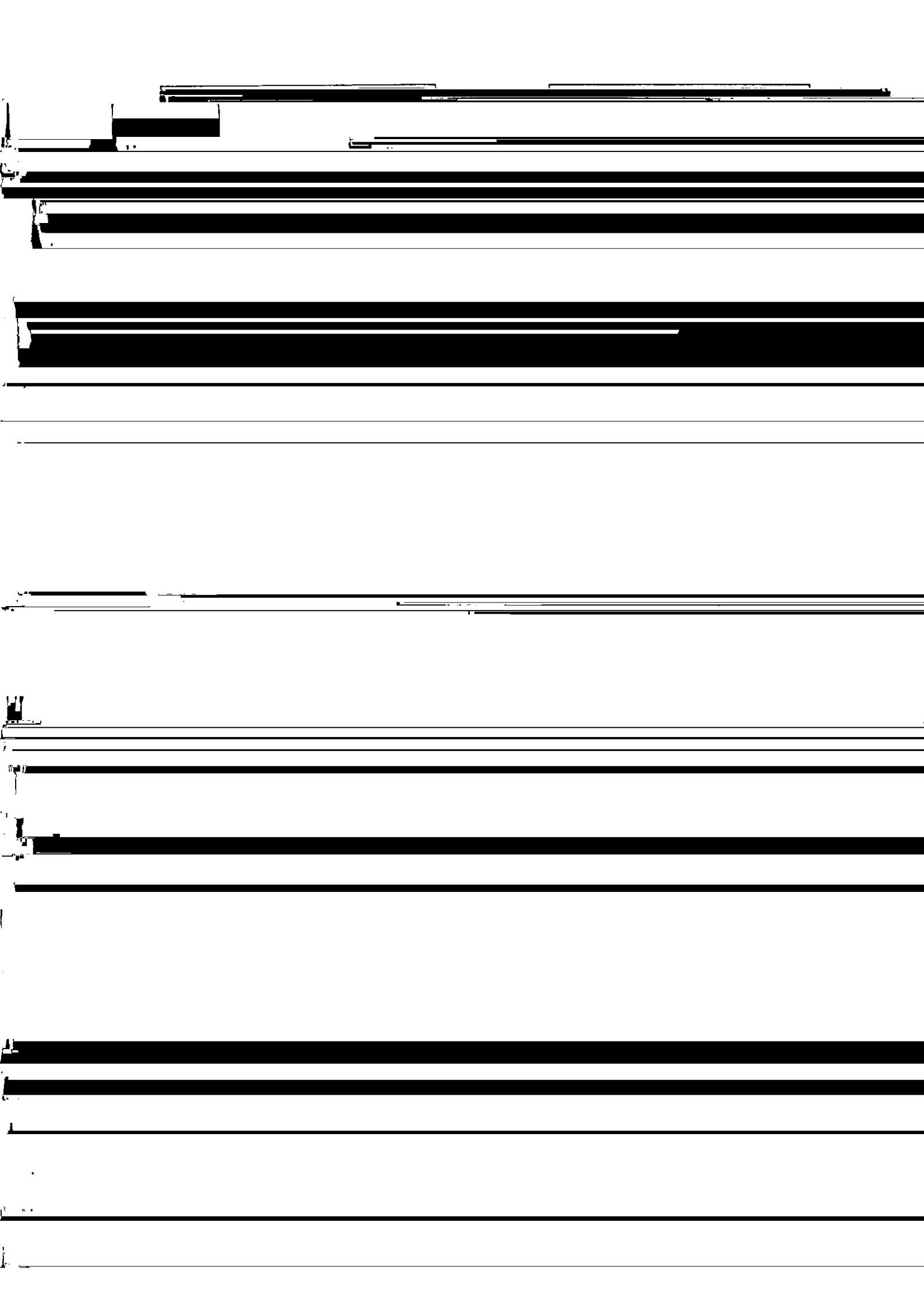


Table 2. Optimum chemistry of high-strength low-alloy steels

Application	Welding consumables		Chemical compositions (wt %)						
	Flux	Wire	C	Si	Mn	Cr	Mo	V	Ti

Property	Value
Yield strength	100
Tensile strength	120
Elongation at break	10
Impact strength	10
Modulus	2000
Hardness	100
Volume change	0
Water absorption	0
Thermal stability	100
Chemical resistance	100
Dimensional stability	100
Electrical properties	100
Flammability	100
Biocompatibility	100
Biodegradability	100
Antibacterial activity	100
Antifungal activity	100
Antiviral activity	100
Antiparasitic activity	100
Anticancer activity	100
Antidiabetic activity	100
Antihypertensive activity	100
Anticholesterol activity	100
Antioxidant activity	100
Anticorrosive activity	100
Antifouling activity	100
Anticancer activity	100
Antidiabetic activity	100
Antihypertensive activity	100
Anticholesterol activity	100
Antioxidant activity	100
Anticorrosive activity	100
Antifouling activity	100

Welding Process	Efficiency Factor	Notes
Narrow gap SAW	0.85	
	0.80	
	0.75	
Wide gap SAW	0.70	
	0.65	
	0.60	
Submerged arc welding	0.55	
	0.50	
	0.45	
Shielded metal arc welding	0.40	
	0.35	
	0.30	
Gas metal arc welding	0.25	
	0.20	
	0.15	