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水素材料先端科学研究センター

DOI: 10.48708/4756007

HYDROGENIUS DATABASE

— Hydrogen Transport Properties —

No. A9

Database of Hydrogen Transport Properties of JIS-SUS304 (Type 304) Austenitic Stainless Steel

2012

Research Center for Hydrogen Industrial Use and Storage (HYDROGENIUS)
Kyushu University - JAPAN

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Date of publication: 2012

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1. MATERIAL

Table 1. Processing details and related properties of SUS304.

Heat	Production Process	Diameter or Thickness (mm)	Format	Date of Issue
A[1)]	Hot-rolling	22	Round bar	2002
B[1)]	Hot-rolling	30	Plate	2005

[1)] After issuance of the inspection certificate.

Table 2. Chemical composition of SUS304.

	Heat		Element (mass%, *mass ppm)								
			C	Si	Mn	P	S	Ni	Cr	Mo	H*
Product Analysis[1)]	A		0.056	0.43	1.72	0.030	0.025	8.87	18.26	0.22	2.2
	B										2.4
Ladle Analysis[2)]	A		0.06	0.36	1.09	0.030	0.023	8.19	18.66		
	B		0.05	0.58	1.24	0.025	0.003	8.09	18.54		
	Requirements[3)]	Max.	0.08	1.00	2.00	0.045	0.030	10.50	20.00		
		Min.						8.00	18.00		

[1)] As performed at HYDROGENIUS.
[2)] After issuance of the inspection certificate.
[3)] As per JIS G 4303:2005 - *"Stainless Steel Bars"* and JIS G 4304:2005 - *"Hot-rolled stainless steel plate, sheet and strip"*.

Table 3. Heat-treatment conditions of SUS304[1), 2)].

Heat	Heat treatment	Conditions
A	Solution treatment	1050°C, 2min, water-quenched
B	Solution treatment	1080°C, 3min, water-quenched

[1)] After issuance of the inspection certificate.
[2)] Heat-treated material was received.

2. MECHANICAL PROPERTIES

Table 4. Mechanical properties of SUS304.

Heat		Tensile Properties				Vickers hardness (HV1)
		0.2% Proof Stress, $\sigma_{0.2}$ (MPa)	Tensile Strength, σ_B (MPa)	Elongation, ε_f (%)	Reduction of Area, φ (%)	
A	1)	309	713	74	82	176
	2)	288	639	58	75	
B	1)	280	665	54	81	193
	2)	262	643	60		

[1)] As performed at HYDROGENIUS according to JIS Z 2241:2011, using a No. 14A-type specimen with a 5-mm diameter and a 25-mm gage length.
[2)] After issuance of the inspection certificate, using a JIS Z 2241:2011 No. 10-type specimen.

4. HYDROGEN TRANSPORT PROPERTIES

Table 5. Hydrogen-charging and hydrogen-measurement conditions.

Type of hydrogen-charging	Exposure to hydrogen gas at a pressure of 10 MPa
Hydrogen gas purity	99.97%
Hydrogen gas temperature & holding time	508 K/1 h, 508 K/200 h, 478 K/1 h, 478 K/2 h, 447 K/7 h, 416 K/20 h, 416 K/25 h, 383 K/90 h, 383 K/95 h
Specimen shape	Disk with a diameter of 7 mm and a height of 0.11 - 1.46 mm.
Type of hydrogen measurement	Thermal desorption spectroscopy using quadrupole mass spectrometer
Heating rate	20 K/min
Error range of hydrogen-content measurement	±5% of the measured value