GH2747 Precipitation hardening high temperature alloy

Introduction

General

GH2747 is a Fe-Ni-Cr-based precipitation hardening high-temperature alloy. It is used in a solid solution state. Its long-term operating temperature is 1100℃~1250℃, while its short-term operating temperature up to 1300℃. The alloy has high strength and good Structural stability, excellent oxidation resistance and corrosion resistance. The alloy has good welding properties and can be welded through various processes. The main products include bars, plates, pipes, wires and forgings, etc.

Application and features:

GH2747 alloy has been used to make high-temperature anti-oxidation components in aviation and aerospace engine combustion chambers and afterburners. It is also used to make various industrial furnace rollers, transmission devices, thermocouple sleeves and other heat-resistant components. It is especially suitable for high-temperature anti-oxidation device parts in petrochemical, nuclear energy, metallurgy and other fields.

The material cost of GH2747 alloy is lower than that of the same type of high-temperature alloy. On the basis of increased chromium and aluminum content, and rare earth elements, the oxidation resistance of the alloy at 1000℃~1300℃ is greatly improved.

Similar grade

3П747(Russia)

Spec

GB/T 14992 Classification and grades of high-temperature alloys and intermetallic compounds high-temperature materials

Q/GYB 511GH2747 alloy hot rolled and forged bars

Q/GYB 512 GH2747 alloy cold drawn (rolled) seamless pipe

Smelting process

Vacuum induction furnace, or vacuum induction furnace + electroslag remelting, or non-vacuum induction furnace + electroslag remelting smelting process.

Chemical composition

Element	C	Cr	Ni	Al	Fe
wt, %	≤0.10	15.00-17.00	44.00-46.00	2.90-3.90	Balance
Element	Ce	Mn	Si	S	P
wt, %	≤0.030	≤1.00	≤1.00	≤0.020	≤0.025

Heat treatment

The material is used as solution treated. 1000°C~1200°C, The holding time depends on the thickness of the material.

ADD: No.2, Xugongqiao Rd, Kunshan City, Jiangsu Province, 215332 China
TEL: +86 512 5523 0901 Email: xun.shi@foxmail.com

Form of supply at Xunshi

Hot rolled & forged rod: diameter 5-300mm

Hot rolled plate: 4-20mm

Cold drawn seamless pipe: diameter 6-100mm

Density

7.78g/cm^3

Thermal conductivity

θ/°C	100	200	300	400	500
λ[W/(m·°C）]	10.5	12.2	13.8	15.4	17.5
θ/°C	600	700	800	900	-
λ[W/(m·°C）]	19.2	20.9	22.6	24.3	-

Linear expansion coefficient

θ/°C	25-100	25-200	25-300	25-400
α/(10^{-6}°C^{-1})	13.66	14.29	14.81	15.15
θ/°C	25-500	25-600	25-700	25-800
α/(10^{-6}°C^{-1})	15.32	15.17	15.80	17.07

Elasticity

θ/°C	20	100	200	300	400
E/Gpa	218	198	190	188	183
θ/°C	500	600	700	800	900
E/Gpa	177	159	146	128	122

Oxidation resistance in air

θ/°C	Oxidation rate[g/m2·h)]			
	100h	500h	1000h	2000h
1200	25	-	46	60
1250	28	42	61	75
1300	33	65	-	174
1350	45	130	-	-

Corrosion resistance in flow air with 1.5% SO_2

θ/°C	Corrosion rate(mm/year)
1200	0.08
1250	0.10
1300	0.24
1350	-

ADD: No.2, Xugongqiao Rd, Kunshan City, Jiangsu Province, 215332 China
TEL: +86 512 5523 0901 Email: xun.shi@foxmail.com

Mechanical properties

Form	Heat treatment	θ/°C	Mechanical properties			
			σ_b/MPa	$\sigma_{P0.2}$/MPa	δ_5/%	Ψ/%
Hot rolled and forged rod	Standard	20	≥550	≥200	≥15	≥20
		1000	≥40	≥20	≥30	≥30
Cold drawn seamless pipe		20	≥600	-	≥30	-

Typical properties of hot rolled rod at different temperature

Specimen/mm	θ/°C	σ_b/MPa	$\sigma_{P0.2}$/MPa	δ_5/%	Ψ/%
Diameter 20 hot rolled rod, standard heat treatment	20	600	300	50	55
	800	150	100	33	30
	900	70	60	35	35
	1000	50	30	40	40
	1100	30	20	70	55
	1200	20	-	90	75

Mechanical properties with different heat treatment under 20°C and 900°C

Specimen	Heat treatment	20°C				900°C			
		σ_b/MPa	$\sigma_{P0.2}$/MPa	δ_5/%	Ψ/%	σ_b/MPa	$\sigma_{P0.2}$/MPa	δ_5/%	Ψ/%
Diameter 20, hot rolled rod	1100°Cx1h/AC	710	290	51	67	117	84	86	82
	1130°Cx1h/AC	655	250	52	69	120	82	108	86
	1150°Cx1h/AC	670	265	55	66	119	81	97	77
	1180°Cx1h/AC	650	240	63	66	121	90	90	82
	1200°Cx1h/AC	645	240	63	66	126	88	74	71

Mechanical properties aging hardened under 1000°C with different period

Specimen	Heat treatment		20°C				1000°C			
	θ/°C	t/h	σ_b/MPa	$\sigma_{P0.2}$/MPa	δ_5/%	Ψ/%	σ_b/MPa	$\sigma_{P0.2}$/MPa	δ_5/%	Ψ/%
Diameter 20 hot rolled rod, standard heat treatment	1000	100	810	330	33	57	64	48	74	98
			790	300	39	55	59	38	101	99
		300	820	330	39	63	58	38	86	98
			805	325	36	58	61	39	79	97
		500	800	310	34	58	98	50	76	97
			815	330	40	62	64	50	84	97

Forming process and performance

Put alloy ingots into the furnace under a temperature of 1000 °C, forging heating temperature 1000-1200°C, open blank temperature above 1000 °C, final rolling temperature above 900 °C. Cold drawn deforming rate of seamless pipe ≤80%, annealing temperature ≥1000 °C, air cool.