

## NIMONIC 80A, ALLOY 80A, UNS N07080, 2.4952

NIMONIC® alloy [80A](#), UNS N07080, 2.4952, 2.4631 is a wrought, age-hardenable nickel-chromium alloy (are primarily composed of nickel and chromium.). Alloy [80A](#) is similar to alloy 75 but made precipitation hardenable by additions of aluminium and titanium. Alloy [80A](#) has good corrosion and oxidation resistance and high tensile and creep-rupture properties at temperatures to 815°C (1500°F). Alloy [80A](#) is used for gas-turbine components (blades, rings, discs), bolts, tube supports in nuclear generators, exhaust valves in internal combustion engines and has many other offshore/marine, automotive and electrical applications.

## Chemical Composition

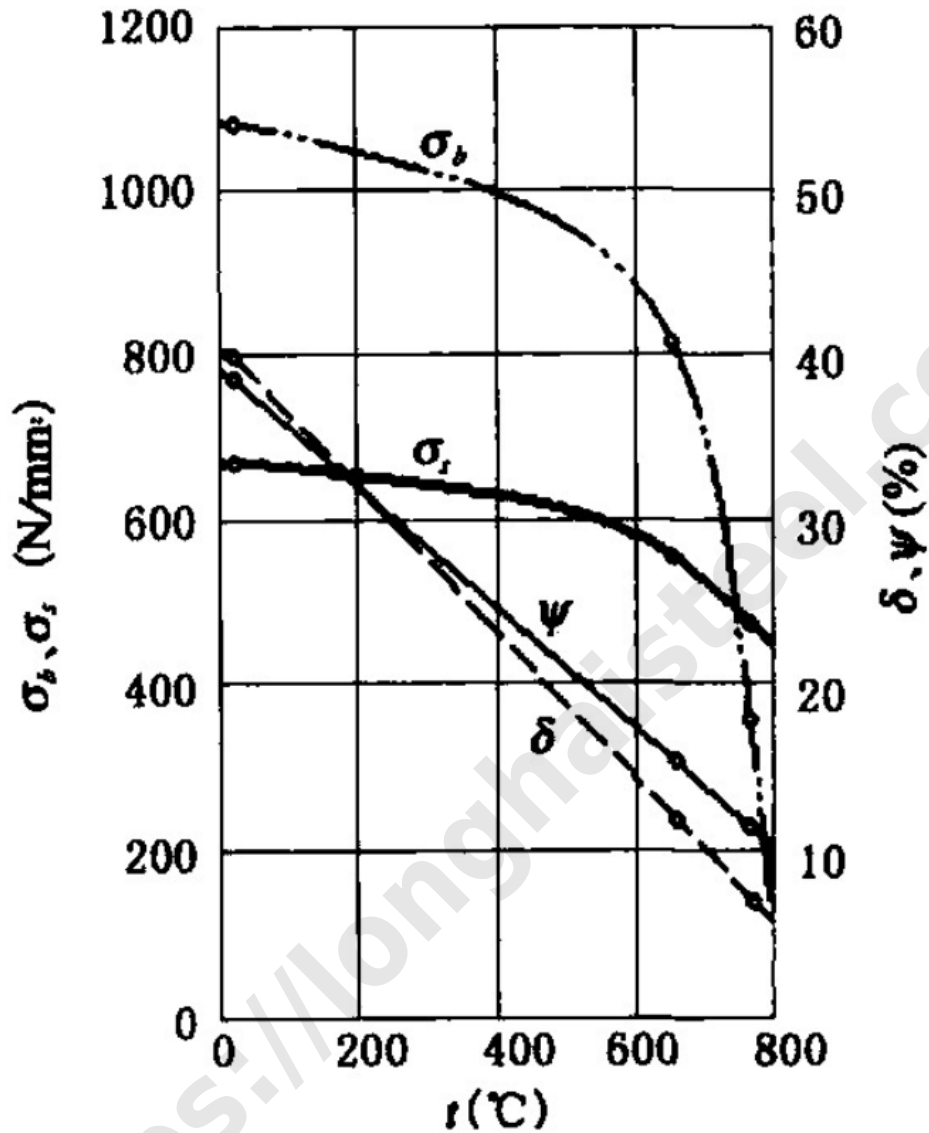
Grade	Chemical composition WT %													
	C	Si	Mn	P	S	Cr	Ni	Ti	Al	Cu	Fe	Co	B	Zr
Nickel Alloy 80A	0.10	1.0	1.0	0.005	0.015	18-21	Bal	1.8-2.7	1.0-1.8	0.2	3.0	2.0	0.008	0.15
Nimonic 80A	0.04-0.1	0.10	1.0	0.005	0.005	18-21	min 65	1.8-2.7	1.0-1.8	0.2	1.5	1.0	0.008	-
UNS N07080	0.1	1.0	1.0	0.045	0.015	18-21	Bal	1.8-2.7	1.0-1.8	0.2	3.0	2.0	0.008	
AFNOR NF NC 20TA	0.04-0.10	1.0	1.0	0.02	0.015	18-21	Bal	1.8-2.7	1.0-1.8	0.2	3.0	2.0	0.008	
2.4952, NiCr 20 TiAl	0.04-0.10	1.0	1.0	0.02	0.015	18-21	min 65	1.8-2.7	1.0-1.8	0.2	1.5	1.0	0.008	
HEV 5							Bal							

## Mechanical Properties

### Nimonic 80A Mechanical properties

- Tensile strength  $R_m$  MPa: 1000-1300
- Yield Strength  $R_p$  MPa: Min 600
- A %: 12
- Hardness, HB 310-400
- Impact Charpy, min 20 J

### Tensile diagram for Nimonic 80A



## Physical Properties

- Density
  - g/cm<sup>3</sup>: 8.19
  - lb/in<sup>3</sup>: 0.296
- Melting Range: 1320-1365°C / 2410-2490°F
- Magnetic Properties
  - Mass Susceptibility:  $5.85 \times 10^{-6}$  at 1000 gauss
  - Volume Susceptibility:  $4.78 \times 10^{-5}$  at 1000 gauss
  - Magnetic Permeability: 1.000601 for 200-2000 oersted

## Heat Treatment

- Solution annealing: 1050°C - 1080°C / 8h / air
- Stabilization: 845°C  $\pm$  10°C / 24h / air

- Precipitation hardening: 700°C ± 10°C / 16h / air

### Nimonic 80A Bolt Heat Treatment

- Step 1: The hot-rolled or forged bars of Nimonic 80A alloy to be manufactured bolts are subjected to solution heat treatment at 1080 ° C ~ 1100 ° C, and the holding time is: bars with a diameter of less than 60mm are kept for 2 to 5 hours, and air is cooled to room temperature; The bar is kept warm for 5-8 hours, and the oil is cooled to room temperature;
- Step 2: After the bar in step 1 is processed into finished bolts that meet the specification requirements, vacuumize the closed workpiece chamber until the vacuum degree is not lower than 1×10<sup>-5</sup>Pa, and then pass AlCl<sub>3</sub> gas into the workpiece chamber to make the workpiece The pressure in the chamber is not lower than 0.4MPa. Finally, place the bolts in an AlCl<sub>3</sub> atmosphere and heat them to 750°C~760°C for chemical-aging heat treatment. The holding time is: 4~6 hours for bolts with a diameter smaller than 60mm, and bolts with a diameter larger than 60mm The bolts are kept warm for 6~8 hours; high-purity argon is used to cool to room temperature; the AlCl<sub>3</sub> atmosphere is a mixed gas composed of AlCl, AlCl<sub>2</sub> and AlCl<sub>3</sub>, which is made by pure aluminum powder and ammonium chloride powder according to 1: (2~6) Prepared by heating to 650°C after mixing the mass ratio

A Nimonic 80A alloy bolt heat treatment process according to claim 1, characterized in that, in step 2, the purity of high-purity argon is not less than 99.99%, and the cooling rate is not less than 10°C/min by controlling the flow rate .

The bolt heat treatment process of a kind of Nimonic 80A alloy material according to claim 1 or 2, is characterized in that, this heat treatment process can obtain the aluminum content that the mass ratio is not less than 15% in the depth of 2 μm on the surface of the bolt, and the hardness is not less than 320HB ; The yield strength at room temperature is not less than 740MPa; the thickness of the oxide film at 850°C/100h in static air is not more than 0.1μm, reaching the complete anti-oxidation level.

### Thermal Properties

Properties	Metric	Imperial
Thermal expansion co-efficient (@20-100°C/68-212°F)	12.7 μm/m°C	7.06 μin/in°F
Thermal conductivity	11.2 W/mK	77.7 BTU.in/hrft <sup>2</sup> .°F

### Welding Properties

Nimonic 80A alloy can be welded using conventional welding techniques such as gas-tungsten arc welding, shielded metal-arc welding and submerged-arc welding.

### Machining Properties

Nimonic 80A alloy can be machined using conventional machining techniques used for iron-based alloys. This alloy work-hardens during machining.