Technical Data

High Performance Corson Alloy

NKC164

JX Nippon Mining & Metals Corporation

1. Introduction

High strength high conductivity copper alloy NK164 has been developed by JX Nippon Mining & Metals to meet the increasing material requirements of interconnect designers. NKC164 is a new Corson alloy(Cu-Ni-Si) with high strength, excellent bend formability and high conductivity in comparison with conventional Corson alloys.

JX Nippon Mining & Metals is also able to provide NKC164 with reflow tin plated.

This technical brochure provides the comprehensive data of high performance copper alloy NKC164 and should help understand the alloy's features.

＊This data included are nominal numbers.

2. Features

（1） Excellent bend formability allows flexible connector design.

（2） Excellent combination of high strength, conductivity and formability.

（3） High stress relaxation resistance.

3. Chemical composition

Table 1 Chemical Composition of NKC164 （wt%）

	Cu	Ni	Si	Sn	Zn
Typical	Bal.	1.6	0.4	0.5	0.4

4. Physical properties

Table 2 Physical Properties of NKC164

Electrical Conductivity	43	%IACS（@20℃）
Specific Resistance	40.1	nΩ・m （@20℃）
Thermal Conductivity	170	W/(m･K)
Coefficient of Thermal Expansion	17.6	$\times 10^{-6}$/K（20 to 300℃）
Young's Modulus	127	GPa
Density	8.87	g/cm^3

5. Mechanical properties

NKC164 offers three tempers depending on strength as shown in Table 3.

Table 3 Mechanical Properties of NKC164

Temper	Tensile strength (MPa)	0.2% yield strength (MPa)	Elongation (%)	Hv
1/2H	560-680	520-670	Min.5	160-230
H	620-740	580-730	Min.3	170-240
EH	680-800	640-790	Min.1	200-270

6. Bend formability

The W-shaped bending test was performed to evaluate bend formability of NKC164. The minimum bending radius (MBR) without surface crack is determined using a specimen with 10mm of width. Table 4 shows MBR/t (Minimum Bend Radius/Thickness).

Figs.1 – 4 show surface appearances and cross sections of 1/2H and H bent to W-shape and U-shape with zero radius, respectively. Fig. 5 shows surface appearances of 1/2H and H(Good way, R/t=1.0). Both 1/2H and H give excellent bend formability. Since the bent surface of 1/2H temper looks even smoother than H temper, 1/2H temper is recommended for applications attached importance to bent surface appearance.

Table 4 Bend formability of NKC164

Temper	MBR ／ t	
	Good way	Bad way
1/2H	0	0
H	0	0
EH	0	1.5

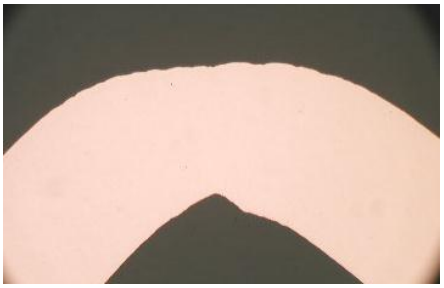
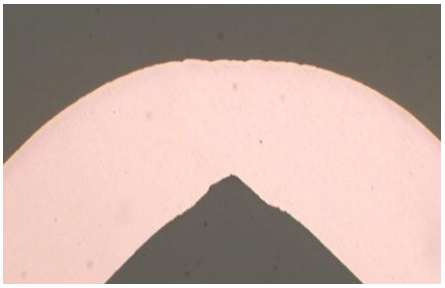
Good way	Bad way
	
Surface appearance	Surface appearance
	
Cross section	Cross section

Fig.1　Surface appearances and cross sections of 90° W-shaped bending test specimens.
Temper H , Thickness = 0.25mm , R/t=0 , Width =10mm

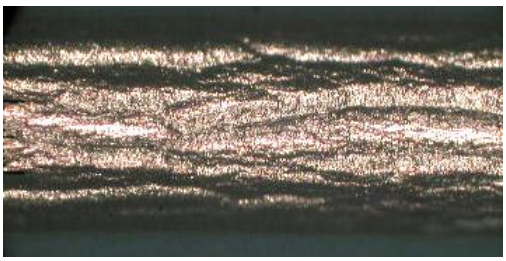
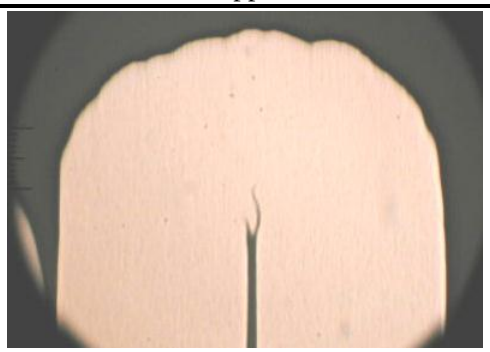
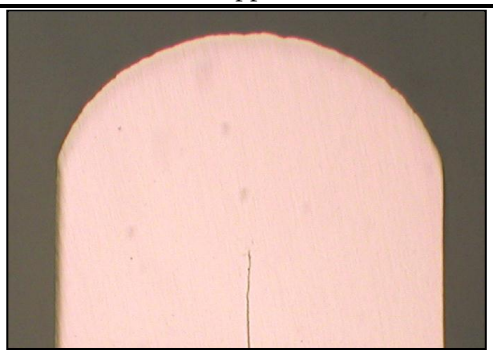
Good way	Bad way
	
Surface appearance	Surface appearance
	
Cross section	Cross section

Fig.2　Surface appearances and cross sections of U-shaped bending test specimens.
Temper H , Thickness = 0.25mm , R/t=0 , Width =10mm

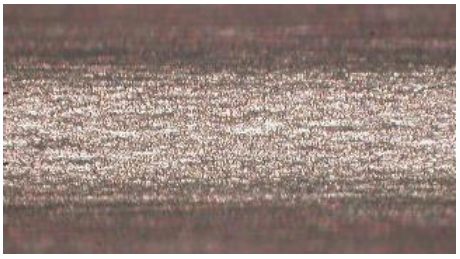
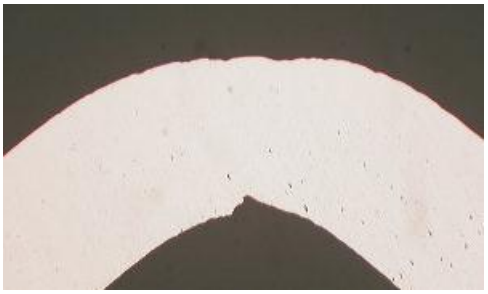
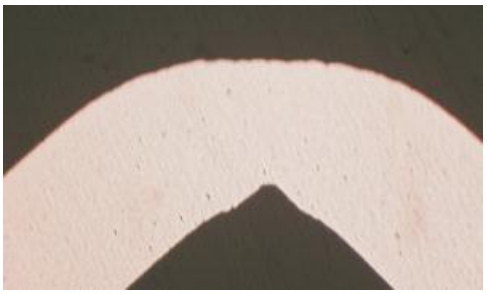
Good way	Bad way
	
Surface appearance	Surface appearance
	
Cross section	Cross section

Fig.3 Surface appearances and cross sections of 90° W-shaped bending test specimens.
Temper 1/2H , Thickness = 0.2mm , R/t=0 , Width =10mm

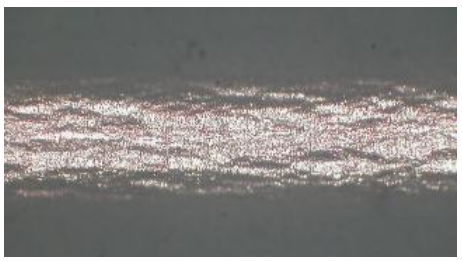
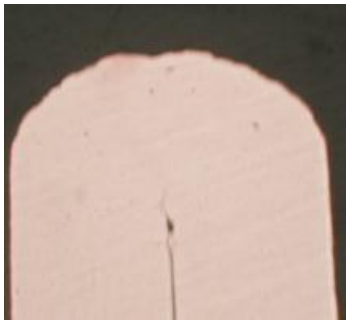
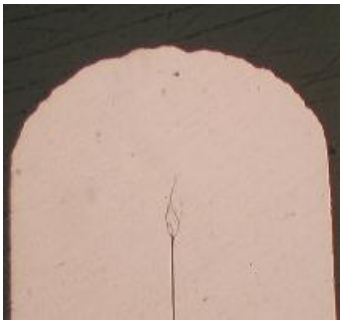
Good way	Bad way
	
Surface appearance	Surface appearance
	
Cross section	Cross section

Fig.4 Surface appearances and cross sections of U-shaped bending test specimens.
Temper 1/2H , Thickness = 0.2mm , R/t=0 , Width =10mm

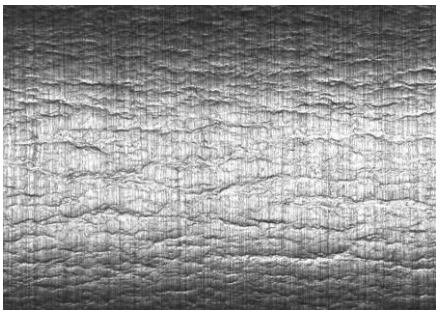
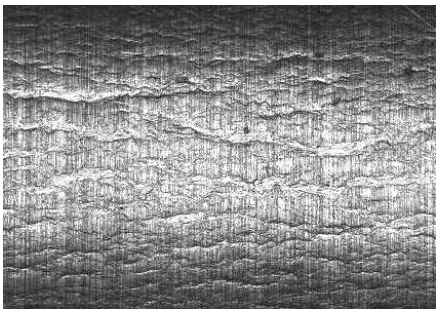
	1/2H	H
Surface appearance		

Fig.5 Surface appearances of 90° W-shaped bending test specimens(R/t=1.0).
Thickness = 0.20mm, Width =10mm, Good Way

7. Stress relaxation resistance

Stress relaxation resistance is highly important for maintaining the contact force for long period of time or at elevated temperatures. Fig.6 exhibits the stress relaxation resistance of NKC164. It is noted that NKC164 maintains over 80% of the initial applied stress after 1000h at 150℃.

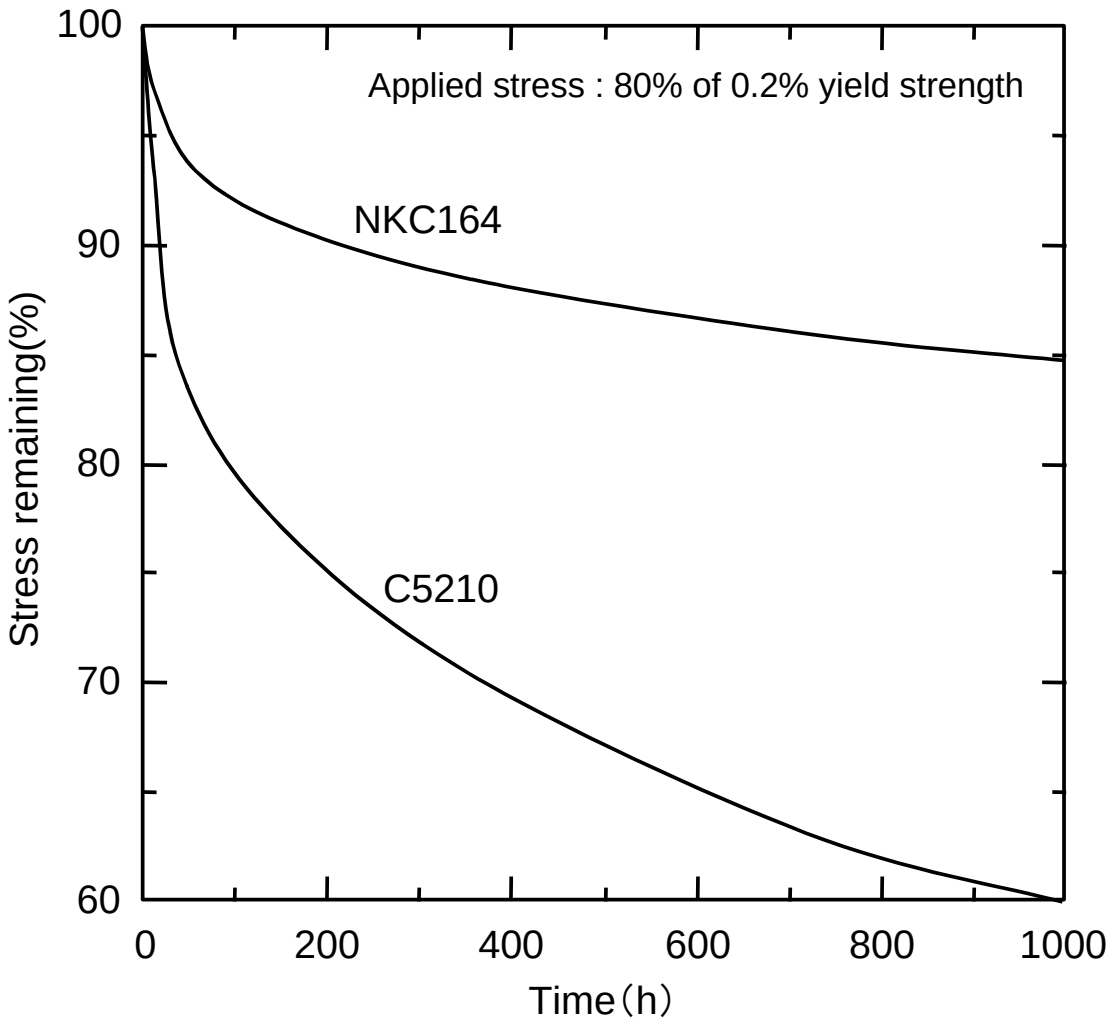


Fig.6 Stress relaxation of connector alloys at 150℃.

8. Stress – Strain curve

Figs.7 and 8 show the Stress-Strain curves for NKC164.

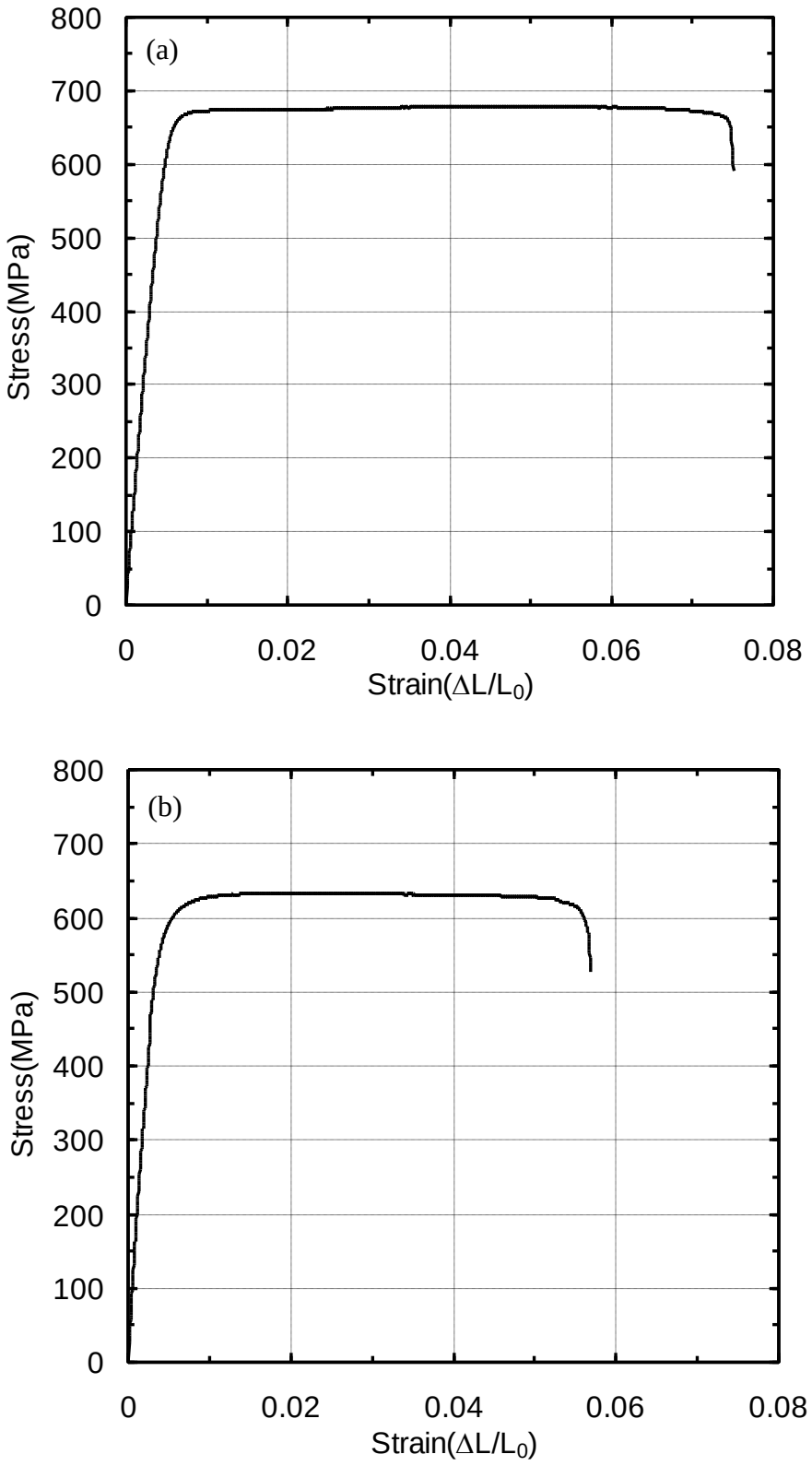
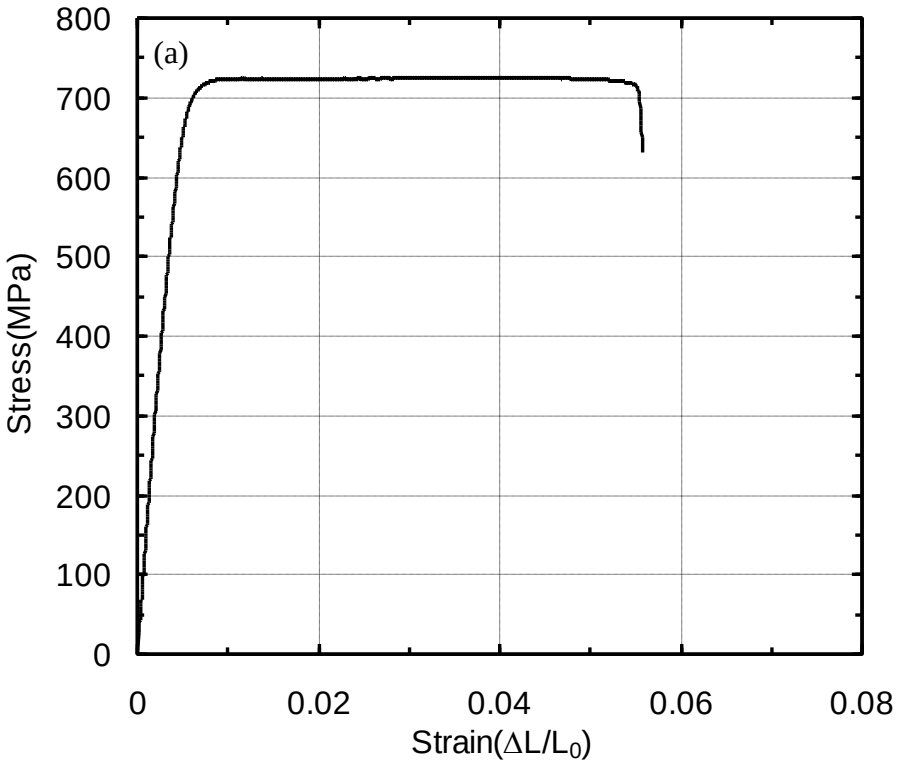


Fig.7 Stress-Strain curves for NKC164-H in the (a)longitudinal and (b)transverse directions.



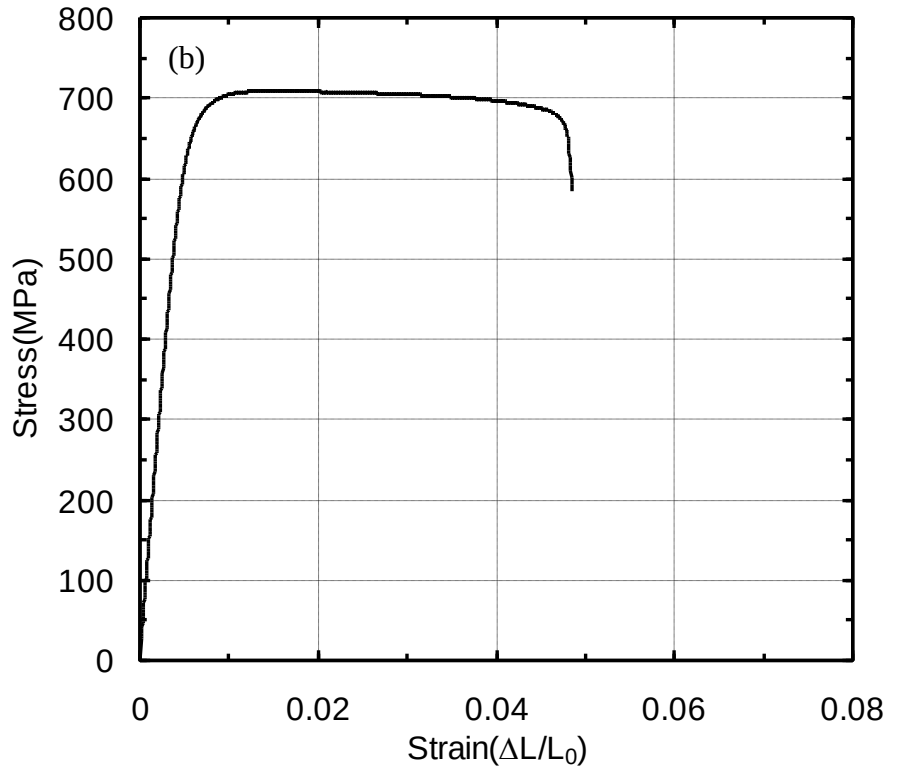


Fig.8 Stress-Strain curves for NKC164-EH in the (a)longitudinal and (b)transverse directions.

＜Further Information＞

JX Nippon Mining & Metals Corporation
Electronic Materials Group
Functional Material Division
Rolled & Fabricated Products Dept.
1-2, Otemachi 1-chome, Chiyoda-ku, Tokyo 100-8164 JAPAN
Phone ：＋81－3－6257－7421
Fax ：＋81－3－6213－3612

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