



FLEX SOLDER MASK

NPR-5 / NBD

- Screen Printable Solder Mask for Flex PCBs -

Product system

Principal material : **NPR-5 / NBD (Green color)**

Hardener : **HARDENER NPR-5 / NBD**

Nippon Polytech Corp.



358-2, Nibukata-cho, Hachioji-shi, Tokyo Japan 193-0822

Tel. 0426-52-0216 / Fax. 0426-52-0218

**1. General**

FLEX SOLDER MASK “NPR-5/NBD” is a flexible solder mask for flexible printed circuit board and TAB applications. This product performs excellent flexible/bending characteristics and flammable resistance.

2. Special Features

- Excellent bending resistance, low warpage, and good heat resistance.
- Stable in electroless Ni/Au plating operation, good plating results is always expectable.

3. Direction to use

i) Preparation of the ink	Mix the principal material “NPR-5/NBD” with the specified hardener “NPR-5/NBD” by an appointed ratio, and stir thoroughly before use. Hold for at least 30 minutes before put into application. * Use the specified thinner SOLVENT #8500 for the purpose, if a dilution is absolutely required.
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Specifications of the ink

	NPR-5 / NBD	Hardener NPR-5 / NBD
Packaging size	945g	63g
Ratio of Resin / Hardener	100 g / 6.7 g	
Form	Green - colored paste	White - colored paste
Flash point (sealed cup, Seta method)	88 deg. C	84 deg. C
Viscosity of mixture (25deg. C, Viscotester VT-04, No.2 rotor)	<u>220 to 280 dPa·s</u>	
Thixotropic Index of mixture (25deg. C, Brookfield HBT)	<u>2 to 14</u>	
Solid content of mixture (at 130deg. C for 1hour in a box oven)	about 74 wt%	
Shelf life (Store at 5 - 15deg. C)	about 60 days	
Pot life (Store at 25deg. C)	about 1 day	
Specified thinner for NPR-5 / NBD	Solvent #8500 (made by Nippon Polytech Corp.)	

ii) Coating	Screen printing application is recommended as for the coating method. A 100 to 180 meshes polyester-based screen is recommended.
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iii) Holding	Hold in a clean area for 10 - 30 minutes at room temperature to antifoam the coated ink.
iv) Thermal curing	Perform the curing in 150 deg. C for 20 - 30 minutes in a box oven.

4. Physical Properties

Test items		Typical value	Reference data
Pencil Hardness on Copper		2H	JIS K 5600, cohesive fracture (scratch)
Adhesive Strength	on Copper	Class 0	JIS K 5600, Tape peeling, Cross-cut test
	on PI film	Class 0	
Heat Soldering Resistance (on Copper)		Pass 2 cycles	applied after RMA flux, 260 deg. C, 5 seconds
Flexibility		Pass	Hard crease at 0.5 MPa pressure
Tg (deg. C)		56 deg. C	TMA method, Tensile mode
CTE (ppm/K)	Before Tg	No data	TMA method, Tensile mode
	After Tg	No data	
Young's modulus (MPa)		No data	1.0 mm/minute
Tensile strength (MPa)		No data	10.0 mm/minute
Breakdown elongation (%)		No data	10.0 mm/minute



5. Resistance to solvent

Boiling water test on Cu film ;60 minutes	No peel off	Tape peeling test
Resistance to solvents on Cu film		
MEK ;30 minutes	No peel off	Tape peeling test after dipped at 23 deg. C
IPA (2-propanol) ;30 minutes	No peel off	
Resistance of acid/base solutions on Cu film		
10%- H ₂ SO ₄ ;30 minutes	No peel off	Tape peeling test after dipped at 23 deg. C
10%- HCl ;30 minutes	No peel off	
5% - NaOH ;30 minutes	No peel off	

6. Resistance of electroless Ni / Au plating

Electroless Ni and Au plating followed by tape test ⁵⁾	No penetration No peel off	Okuno Chemical Ind. ICP process ⁶⁾
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6) Plating condition; Okuno Chemical Ind. ICP process

i) ICP clean (23 deg. C, 1 minute), ii) soft etch [15% (NH₄)₂S₂O₈, 1% H₂SO₄] (23 deg. C, 1 minute), iii) 10% H₂SO₄ (23 deg. C, 1 minute), iv) 3.5% HCl (23 deg. C, 1 minute), v) ICP accel. (23 deg. C, 1 minute), vi) ICP nicolon USD [10% U-M, 5% U-10] **(80 deg. C, 20 minutes, about 6 μm)**, vii) 3.5% HCl (23 deg. C, 1 minute), viii) OPC mudengold [10% OPC mudengold] **(80 deg. C, 20 minutes, about 0.08 μm)**, ix) Hot water (80 deg. C, 10 minute)

7. Electrical Properties

Reliability Test Results		Typical value	Reference data
Insulation resistance (ohm)	Line / Space=50 / 50μm	> 10 ¹²	23 deg. C / 55%Rh
	Line / Space=100 / 100μm	> 10 ¹²	
Surface Resistance (ohm)		No data	JIS C6481
Volume Resistivity (ohm · cm)		No data	JIS C6481
Dielectric Constant (εr)	1 MHz	4.3	JIS C6481, 1MHz
Dielectric Loss Factor (tan δ)	1 MHz	0.06	JIS C6481, 1MHz
Dielectric Strength		60 kV/mm	TM-2.5.6.1 of IPC-TM650



8. Reliability Test Results

HHBT <u>Line / space = 50μm / 50μm</u>	850H	$8 \times 10^8 \text{ ohm}$ No dendrite	<u>85 deg. C/85%Rh/100V DC</u> (The resistance are measured at test condition.)
	1000H	$< 10^8 \text{ ohm}$ dendrite	
PCT	on Cu substrate	Peel off	<u>121deg. C/0.2MPa/98h</u> Tape peeling; Checker flag type, Test pieces; IPC-TM-650 No. 2.4.28.1
	on PI film	Peel off	

9. Preparation condition of the test pieces

Substrate:	PI: Kapton H, PI-Cu: Upisel N (PI/Cu=25/12μm)	Du Pont-Tray Co., Ltd. Ube Industries. Ltd.
Thickness of solder mask	About 25 μm	
i) Preparation of the ink	Held for 30 minutes after mixing	Used a resin mixer, at room temperature
ii) Coating	150 meshes polyester-based screen	A hand printing
iii) Holding	23 deg. C, 10 minutes	In the room
iv) Thermal Curing	150 deg. C, 30 minutes	Box oven

10. Green Procurement Survey

NPR-5/NBD contains 2 wt% of Phthalocyanine Green Pigment as the organic pigment. This Pigment comes under Copper and Copper Compound (No. 26, Substance Group No. D01) in List A (Appendix 2-2, Level B) based on Guideline for Standardization of Material Declaration (on July 22, 2003 revision) published by Japan Green Procurement Survey Standardization Initiative(JGPSSI; <http://home.jeita.or.jp/eps/>).

Also, these products is not used the materials/compounds surveyed Chemical Substance except the organic pigment in the manufacturing process.



11. Special notice

- ✓ Handling
 - The surface hardness of coated film is not hard enough before the thermal curing process. Take it carefully when in handling.
- ✓ Environment of workshop
 - A clean-room is required.
 - Room temperature: 22 to 26 deg. C
 - Humidity: 50 to 60 %Rh
- ✓ Storage
 - Store at a certain cool and dark area. Temperature in 5 to 15 deg. C is recommended. Avoid direct sunshine and flame.
 - Hold in room temperature for about 1 day before use, if the storage temperature is under 15 deg. C.
- ✓ Hygienic work Practices
 - Local exhaust is required to be set up in workshop.
 - Wear on suitable protective clothing when in operation.
 - Avoid direct skin contact. Flush with soap and plenty of water thoroughly, if direct contact with skin.
 - Flush hands, face and body with soap and plenty of water after handling.
- ✓ Inflammability
 - The Principal material “**NPR-5 / NBD**” is the **flammable solid**, and the hardener “**NPR-5 / NBD**” is the **flammable solid**. **Attention to fire or other sources of ignition.**

12. Caution

As to health hazard data, precaution for safe handling/use and others, please refer to the MSDS (Material Safety Data Sheet) of NPR-5/NBD when in application.

In order to get and confirm the sufficient performance, please do the test thoroughly at your end before use.

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