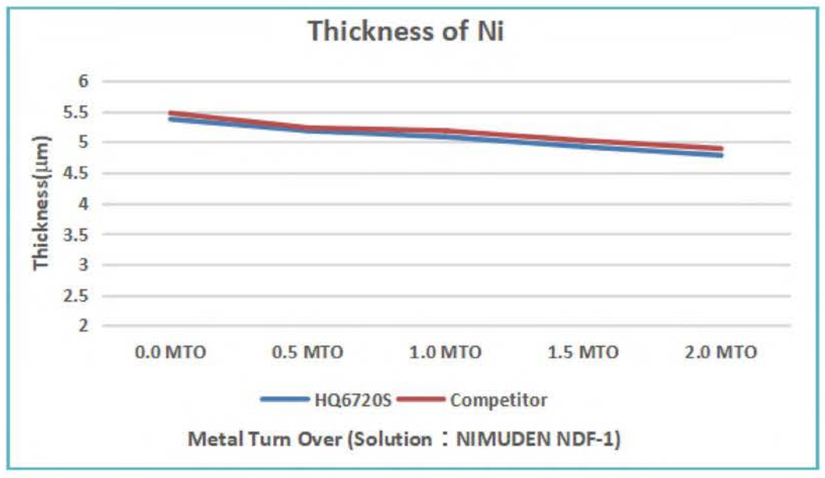
長興材料

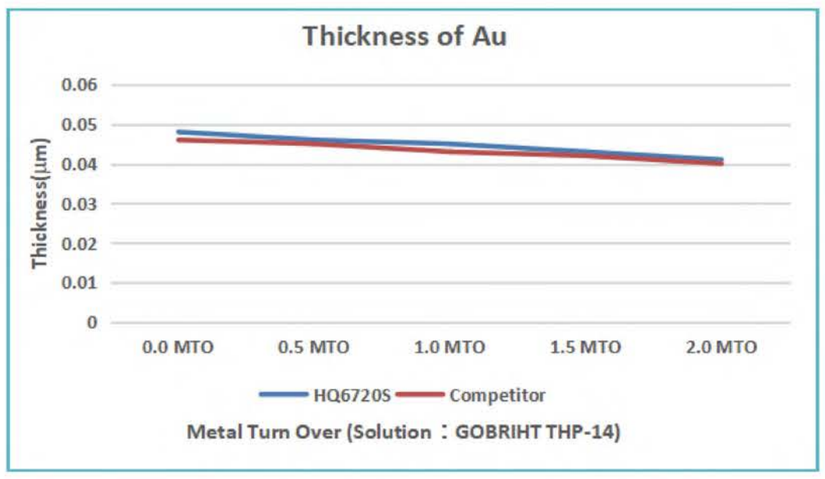
# ETERNAL MATERIALS

## Photoresist Materials Division

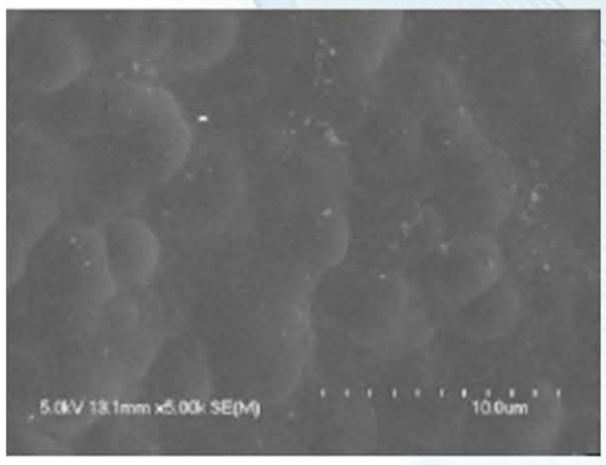
# Dry Film Photoresist for ENIG & ENEPIG HQ6700S / HQ6600

## ENIG / ENEPIG HQ6700S

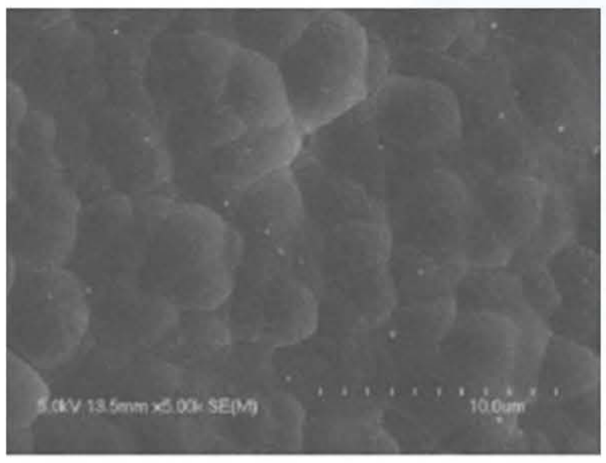



**Deposited Thickness of Ni & Au**



**Blank**
**Ni/Au：**
**0/0 MTO**



**After OSPx3**
**Ni/Au：**
**2.0/8.5 MTO**

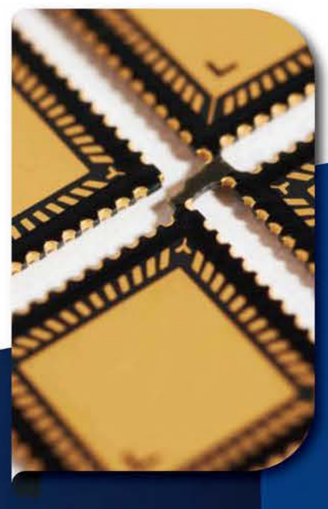
**Observation of Nickel Morphology After OSPx3**

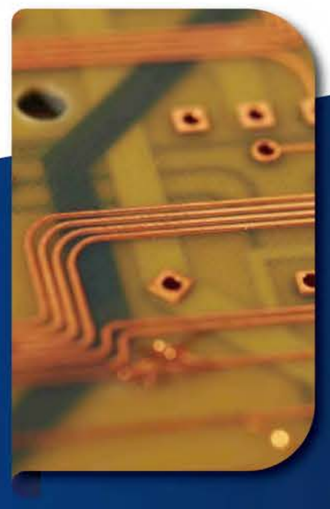
| DF | Substrate | HQ6620* | HQ6720S** | Competitor** |
|---|---|---|---|---|
| Stripping Break Time /25/41sst (5% Organic Stripper, 60℃) | Cu | 144 sec | 138 sec | 176 sec |
| | S/M | 153 sec | 217 sec | 222 sec |
| | FRP | 190 sec | 269 sec | 256 sec |

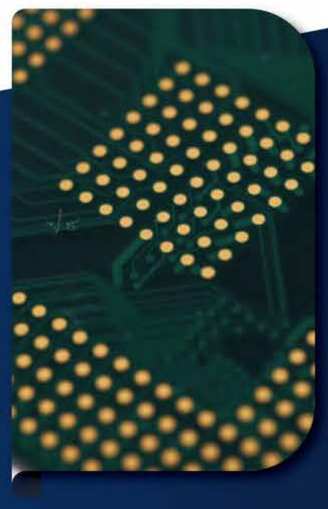
Condition：*after Dev., post Bake at 145℃/30min, then UV bump 700 mJ/cm$^2$
**after Dev., post Bake at 135℃/30min, then UV bump 700 mJ/cm$^2$

**Advantages**

1. Good chemical resistance to gold plating & ENIG & ENEPIG process
2. Good chemical resistance to alkaline etchant
3. Lower leaching amount
4. Easy stripping







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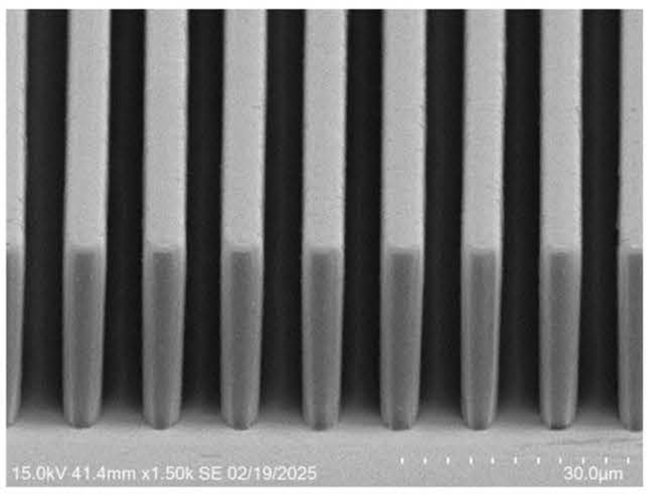
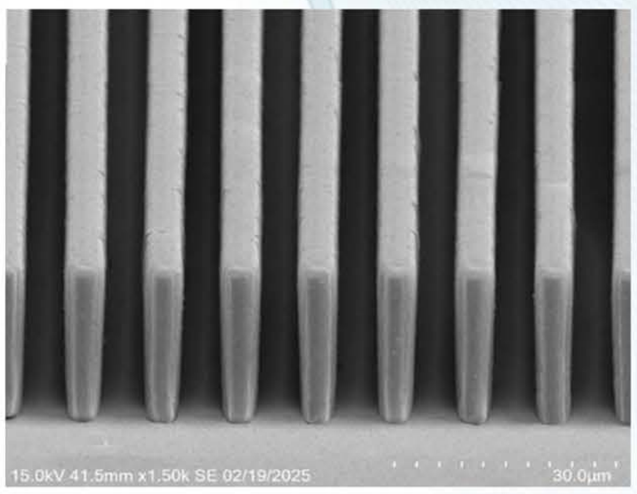
# Dry Film Photoresist for IC Packaging Application UDH5700

**UDH5700**
**Direct Imaging**
**mSAP**




**UDH5725**
**L/S 5/5 µm**




**UDH5715**
**L/S 4/4 µm**

## CHARACTERISTICS

| DF | UDH5725 | UDH5715 |
|---|---|---|
| DF Thickness | 25 µm | 15 µm |
| Photo Speed * | 60 mj/cm$^2$ | 60 mj/cm$^2$ |
| 41sst | 13 | 13 |
| Minimum Developing Time x 2 | 36 sec | 27 sec |
| Adhesion / Resolution | 5 / 5 µm | 4 / 4 µm |

*ADTEC, h-line

**Advantages**

1. **Excellent adhesion & resolution**
2. **Excellent resistance to acid plating**
3. **Good sidewall profile**

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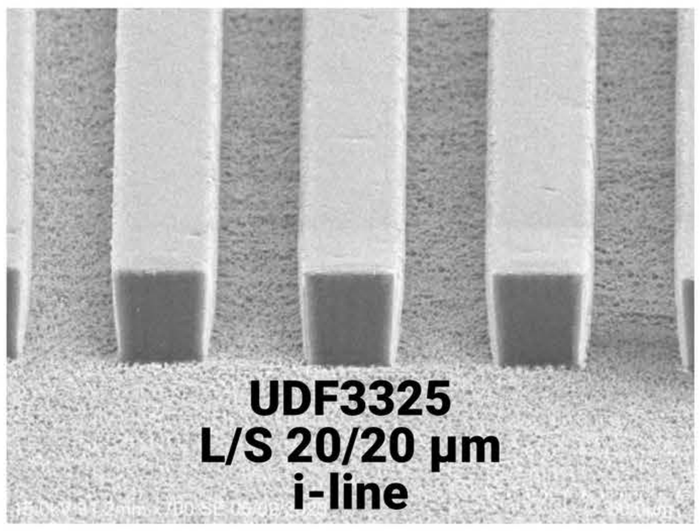
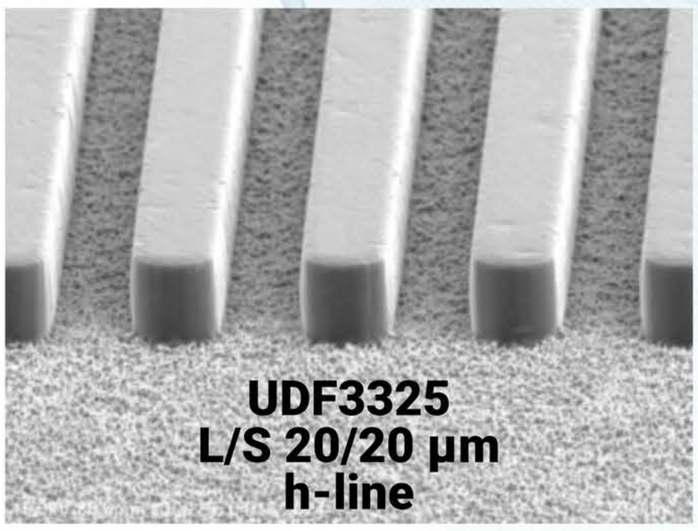
# Dry Film Photoresist for HDI / Anylayer HDI Application UDF3300

**UDF3300**
**For Pitch ≧ 80 μm**
**Direct Imaging (i- & h-line)**




## CHARACTERISTICS

| DF | UDF3335 | UDF3325 |
|---|---|---|
| DF Thickness | 34 μm | 24 μm |
| Photo Speed (i-line) * | 23 mj/cm$^2$ | 15 mj/cm$^2$ |
| Photo Speed (h-line) ** | 31 mj/cm$^2$ | 20 mj/cm$^2$ |
| 41sst | 19 | 16 |
| Minimum Developing Time x 2 | 42 sec | 31 sec |
| Adhesion / Resolution (i-line) | 24 / 26 μm | 20 / 20 μm |
| Adhesion / Resolution (h-line) | 24 / 26 μm | 20 / 20 μm |
| Tent Via (Φ) | 6 mm | 4 mm |

*i-line: KLA LDI **h-line: ADTEC

**Advantages**

1. **Fast phtospeed**
2. **Good adhesion & resolution**
3. **Good tenting ability & resistance to acid etchant**

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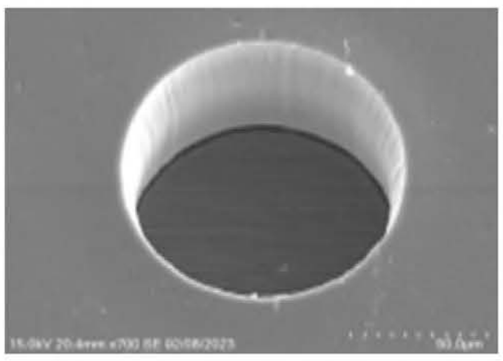
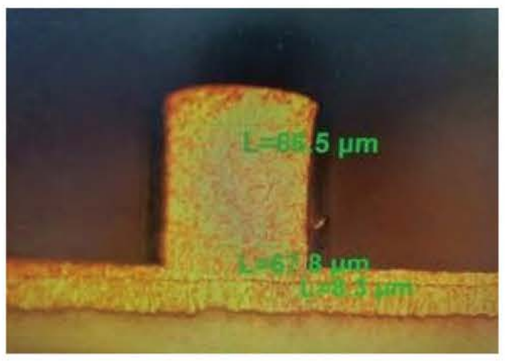
# Dry Film Photoresist for Copper Pillar Bump Application BR41000 / BR42000

**BR41120**
**Direct Imaging**
**(Single-Wavelength, i-line)**

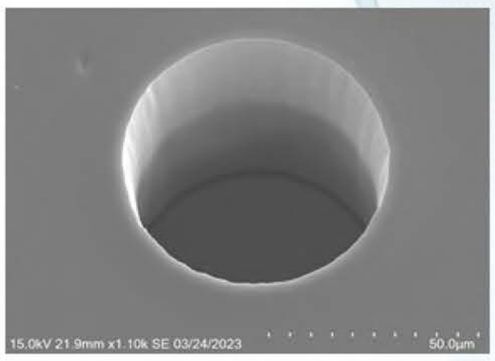
**BR42240**
**Stepper / Aligner**
**(Multi-Wavelength/Broad Band)**

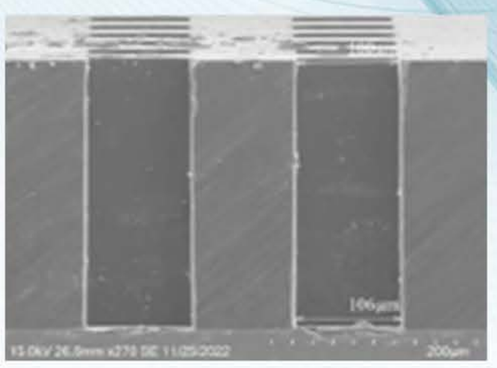


**Via Resolution 60 μm**



**Perpendicularity**
**98.8%**
**After copper plating**





**Via Resolution 80 μm**

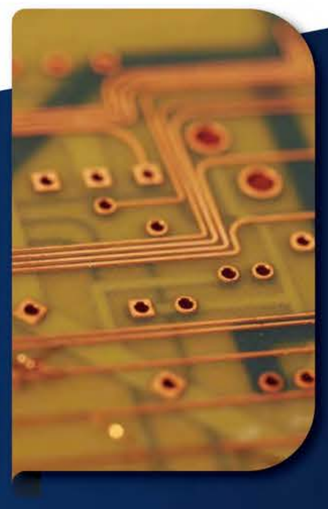
## CHARACTERISTICS

| DF | BR41120 | BR42240 |
|---|---|---|
| DF Thickness | 120 μm | 240 μm |
| Photo Speed | 500 mj/cm$^2$ | 220 mj/cm$^2$ |
| Minimum Developing Time x 2 | 2 min 16 sec | 5 min 16 sec |
| Via Resolution (Φ) | 60 μm * | 80 μm ** |

*Nuvogo LDI, i-line **Ushio Projection, i-line

## Advantages

1. **Good via resolution**
2. **Good resistance to acid plating**
3. **Faster stripping & small flake size**
4. **Good dissolvability to specific stripping chemistry**



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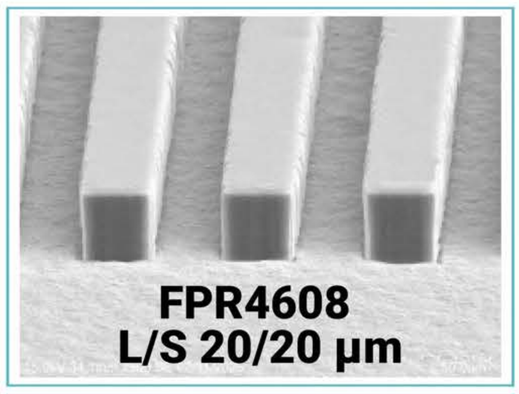
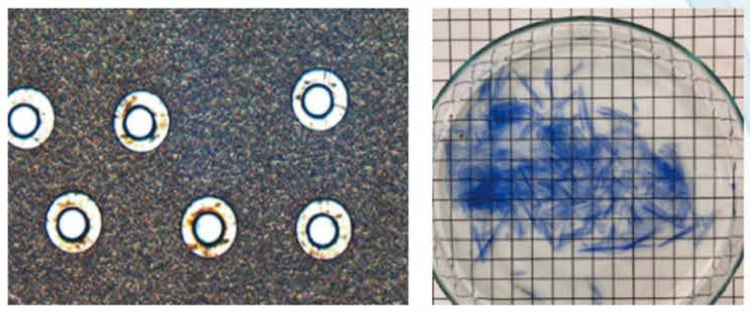
# Dry Film Photoresist for FPC Application FPR4600 / FPR4700 / FPR4800

**FPR4600 / FPR4700**
**For Pitch ≧ 80 μm**

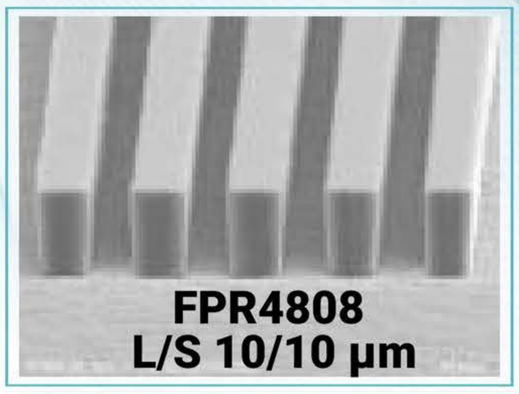
**FPR4800**
**For Pitch ≧ 60 μm**



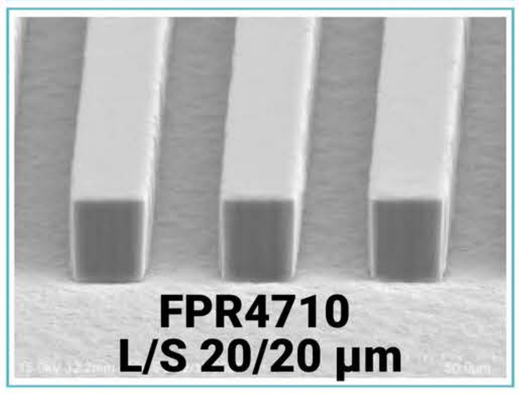
FPR4608
L/S 20/20 μm



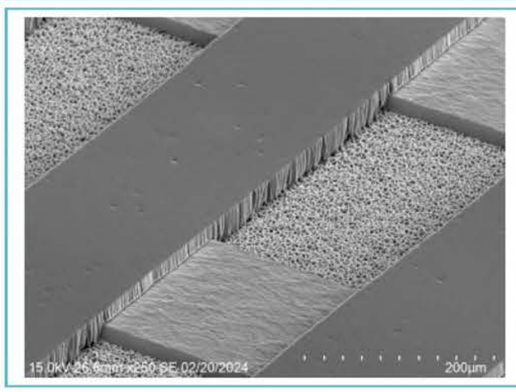
Easy strip ViaΦ 225 μm



FPR4808
L/S 10/10 μm



FPR4710
L/S 20/20 μm



Conformance
(wet. Lam.
depth 15 μm)

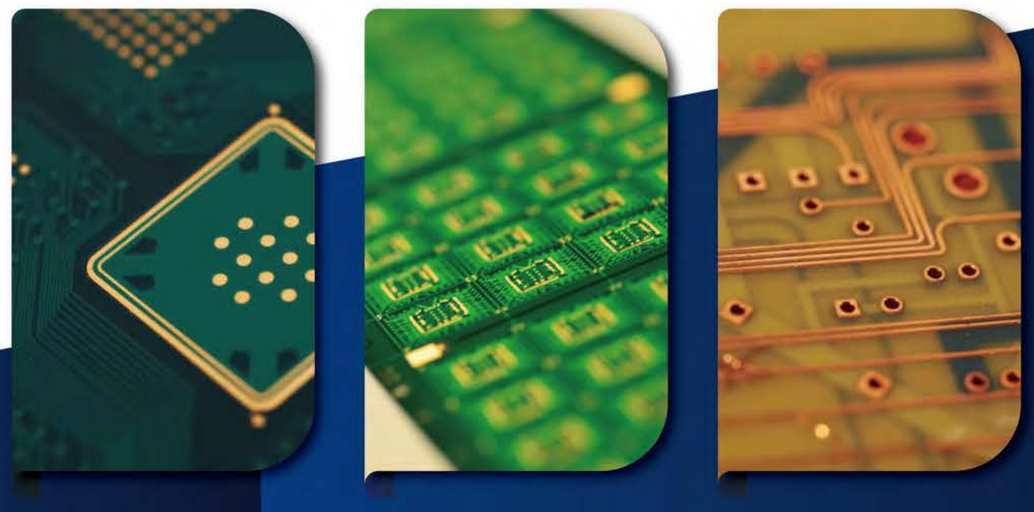
## CHARACTERISTICS

| DF | FPR4608 | FPR4710 | FPR4808 |
|---|---|---|---|
| DF Thickness | 20 μm | 25 μm | 20 μm |
| Photo Speed * | 28 mj/cm$^2$ | 63 mj/cm$^2$ | 95 mj/cm$^2$ |
| 41sst | 16 | 16 | 13 |
| Minimum Developing Time x 2 | 24 sec | 28 sec | 26 sec |
| Adhesion / Resolution | 14 / 18 μm | 14 / 18 μm | 6 / 8 μm |
| Tent Via (Φ) | 3 mm | 3 mm | 3 mm |
| Via Without Residue after Stripping (Φ) | ≧ 0.25 mm | ≧ 0.3 mm | ≧ 0.25 mm |

* Collimated Light

## Advantages

1. Small stripping flake size
2. Good adhesion & resolution
3. Good performance wet lamination



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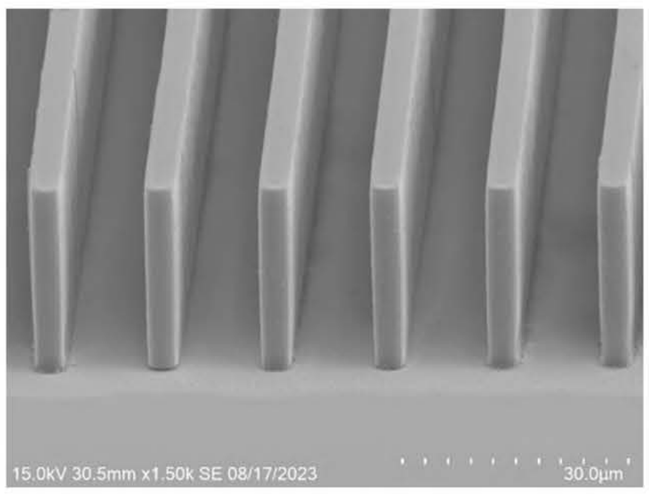
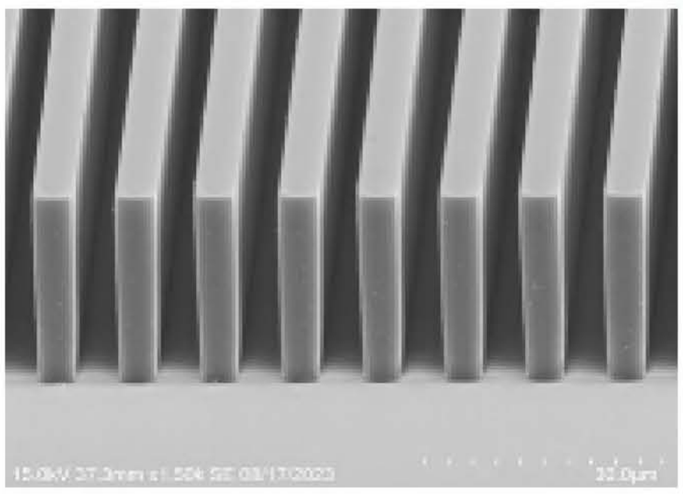
# Dry Film Photoresist for IC Packaging Application APR900

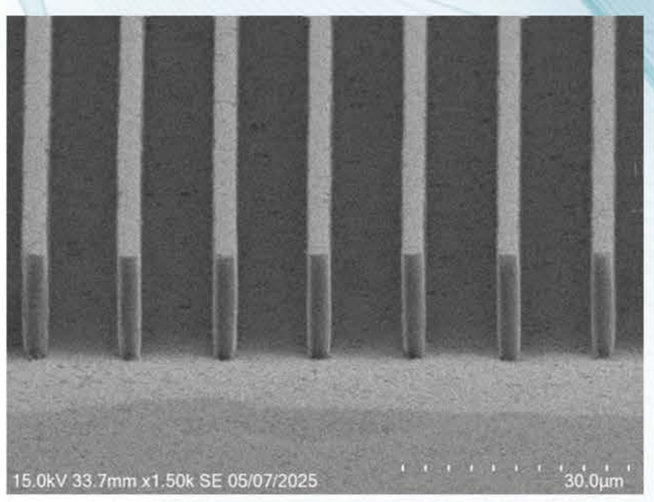
**APR900**
**Stepper / Aligner**
**SAP**




**APR910**
**L/S 4/16 µm**



**APR910**
**L/S 4.5/4.5 µm**




**APR906**
**L/S 2.5/10 µm**

## CHARACTERISTICS

| DF | APR910 | APR906 |
|---|---|---|
| DF Thickness | 24 µm | 15 µm |
| Photo Speed * | 175 mj/cm$^2$ | 160 mj/cm$^2$ |
| 41sst | 16 | 16 |
| Minimum Developing Time x 2 | 43 sec | 26 sec |
| Adhesion / Resolution | 4 / 4.5 µm | 2.5 / 2.5 µm |

*Ushio Projection Aligner

**Advantages**

1. **Excellent adhesion & resolution**
2. **Excellent resistance to acid plating**
3. **Good sidewall profile**

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ALPHO® ドライフィルムフォトレジスト

# HDI基板対応 ALPHO® LIP2100シリーズ

## For HDI manufacturing process ALPHO® LIP2100 series

For DI / LDI

**特長 Features**

- HDI回路形成に適したドライフィルムフォトレジストです。高感度、高解像、高い追従性により歩留まりと生産性に貢献します。
  Dry Film Photo Resist suitable for HDI manufacturing process. Contribute to high yield ratio and productivity by its high photosensitivity, high resolution and high conformance to base materials.

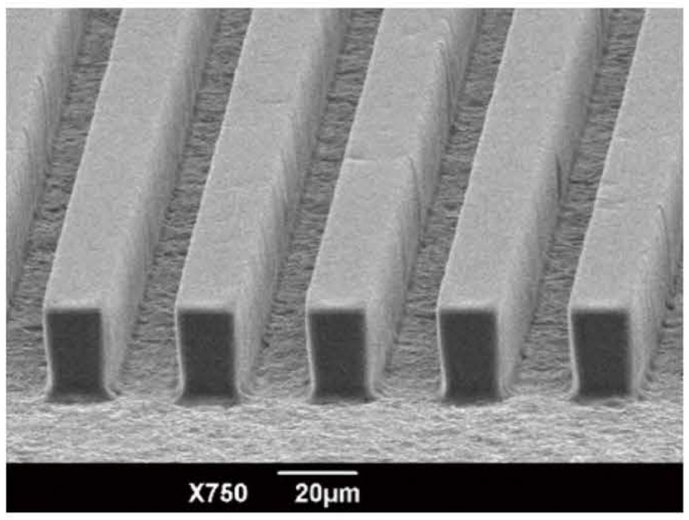
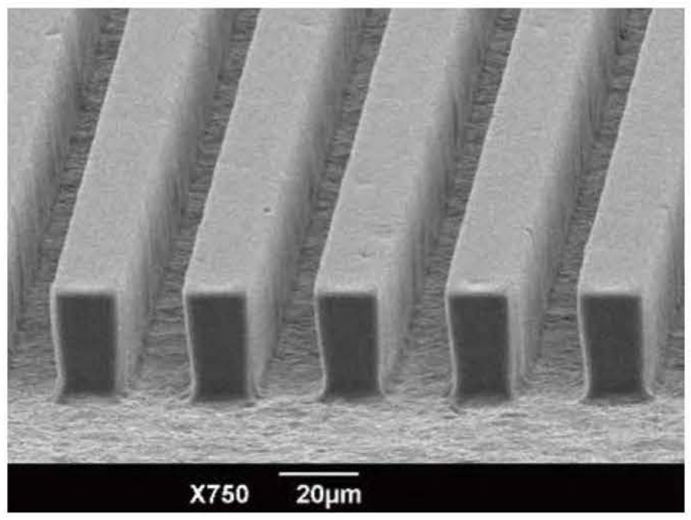
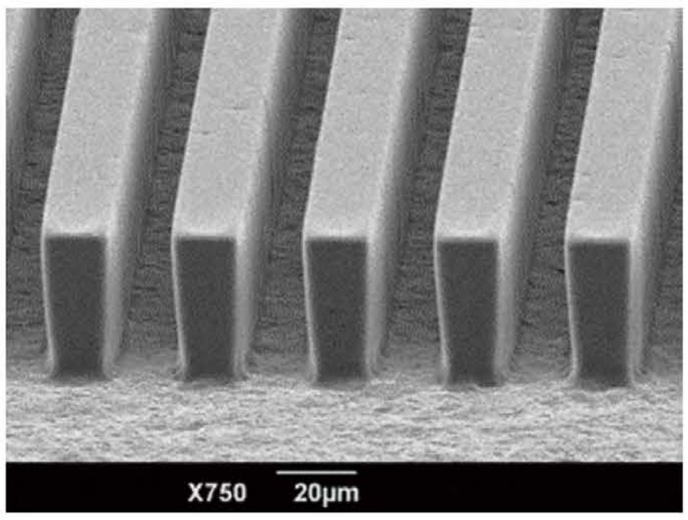
**使用例 Applications**

- HDI基板、高多層基板内層エッチング
  HDI, MLB Inner Etching
- 各種ダイレクトイメージング露光機対応
  Various Direct Imaging（DI）Exposure System

## レジスト特性 Resist performance

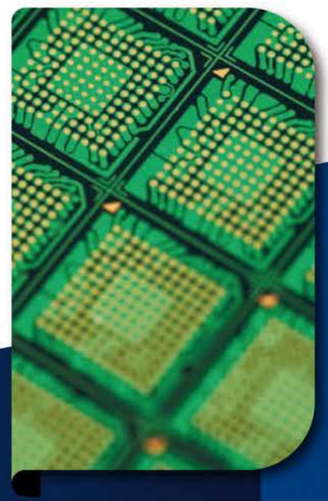
| Dry film | LIP2125 | LIP2129 | LIP2140 |
|---|---|---|---|
| レジスト厚<br>Resist Thickness（μm） | 25 | 29 | 40 |
| 最少現像時間※1<br>Minimum Developing Time（sec.） | 18 | 21 | 27 |
| 露光量※2<br>Exposure Energy（mJ/cm²） | 21 | 24 | 35 |
| 解像密着性<br>Resolution and Adhesion L/S=x/x（μm） | 17 | 17 | 17 |
| 細線密着性<br>Adhesion L/S=x/9x（μm） | 15 | 17 | 22 |

※1 現像条件（Developing condition）：1.0%$Na_2CO_3$, 30°C, BP x 2
※2 DI露光（Direct imaging exposure）：h-line DI Machine

| LIP2125<br>L/S=17/17μm | LIP2129<br>L/S=17/17μm | LIP2140<br>L/S=17/17μm |
|---|---|---|
|  |  |  |







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ALPHO® ドライフィルムフォトレジスト

# SAP/mSAP対応 ALPHO® LDF800シリーズ

## For SAP mSAP process ALPHO® LDF800 series（under R&D）

For DI / LDI

### 特長 Features

- パッケージ用サブストレートの配線形成に適したh線DI露光に対応した高解像ドライフィルムフォトレジストです。
  High resolution Dry Film Photoresist suitable for patterning of Packaging substrate.
  Designed for h-line direct imaging exposure machine.
- 良好な剥離性及び柔軟性を有しているため、めっき潜り及びめっき後のレジスト残渣低減に優れています。
  LDF800 has good stripping ability and flexibility so it has excellent performance for reduction of under plating and resist residue.

### 使用例 Applications

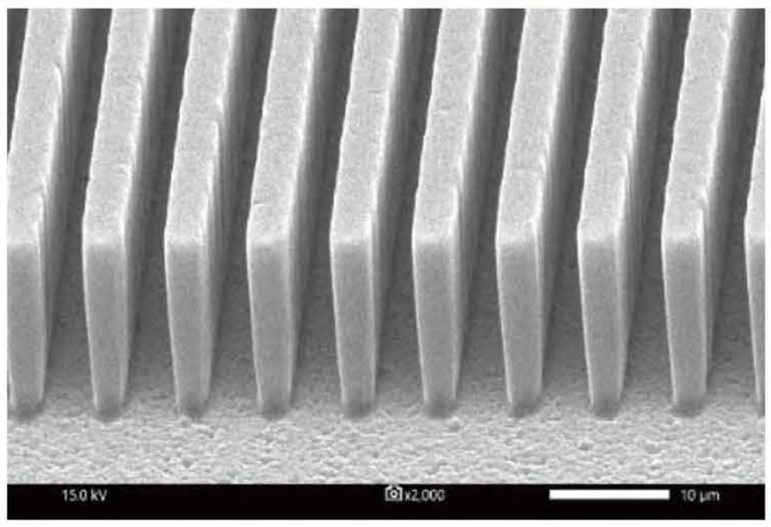
- SAP, mSAP, SLP, Fine line etching

## レジスト特性 Resist Performance

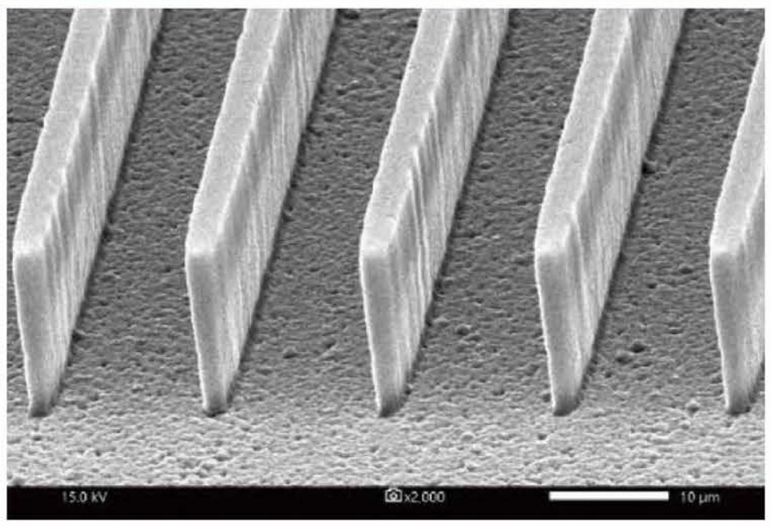
| Dry film | LDF815 |
|---|---|
| レジスト厚<br>Resist Thickness（μm） | 15 |
| 最少現像時間※1<br>Minimum Developing Time（sec.） | 14 |
| 露光量※2<br>Exposure Energy（mJ/cm²） | 61 |
| ステップ段数<br>Photosensitivity（41SST） | 14 |
| 解像密着性<br>Resolution and Adhesion（μm） | 実測線幅：3.5<br>actual line width |
| 独立細線密着性<br>Isolated Fine Line Adhesion（μm） | 実測線幅：3.0<br>actual line width |

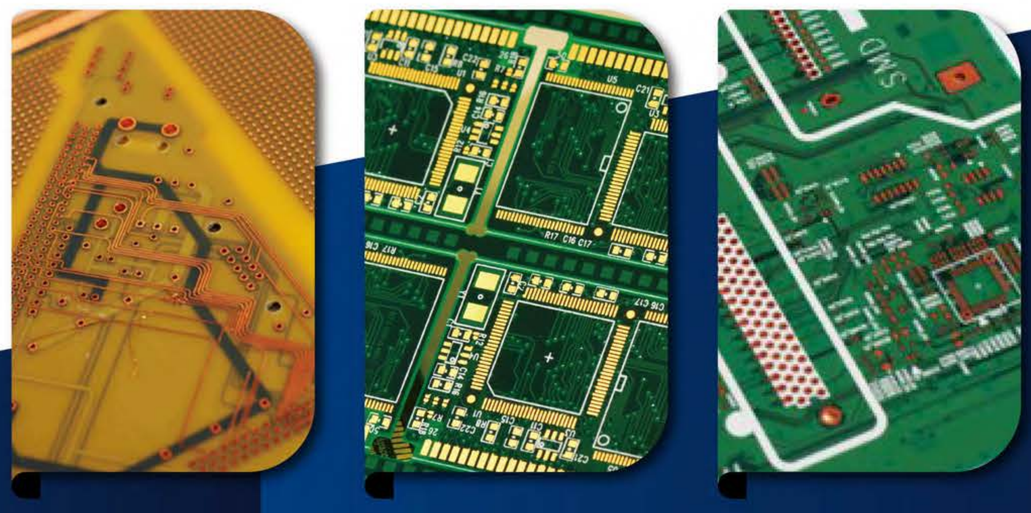
※1 現像条件（Developing condition）：1.0% $Na_2CO_3$, 30°C, 0.15MPa, M.D. x 2
※2 DI露光（Direct imaging exposure）：オーク製作所製 GDi-MP（ORC GDi-MP）, Post exposure bake：70°C, 30sec.

解像密着性 Resolution and Adhesion
実測：L/S=3.5/3.3μm actual line width




独立細線密着性 Isolated Fine Line Adhesion
実測：L/S=3.0/11.4μm actual line width



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# ALPHO® ドライフィルムフォトレジスト

# Additive用途 ALPHO® NIT8300シリーズ

## For SAP/mSAP process ALPHO® NIT8300 series

For Projection

### 特長 Features

- i線プロジェクション露光に対応したSAP/mSAP用高解像密着のドライフィルムフォトレジストです。
  For SAP/mSAP high resolution/adhesion Dry Film Photoresist which is suitable for patterning with i-line Projection exposure machine.
- パッケージ基板を使用する工程で求められる、低露光量で高解像密着性を得られるドライフィルム・フォトレジストです。
  Achieved excellent high resolution/adhesion property with low exposure energy required in package substrate process.
- 短い剥離時間で工程に優れるドライフィルムです。
  Shorten stripping time which is good for process.

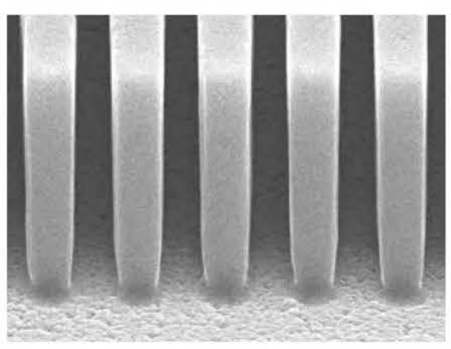
### レジスト特性 Resist Performance

| Dry film | NIT8315 | NIT8319 |
|---|---|---|
| レジスト厚<br>Resist Thickness (μm) | 15 | 19 |
| 最少現像時間※1<br>Minimum Developing Time (sec.) | 18 | 22 |
| 露光量※2<br>Exposure Energy (mJ/cm²) | 130 | 130 |
| 解像密着性<br>Resolution and Adhesion L/S=x/x (μm) | 4 | 4 |
| 細線密着性<br>Fine Line Adhesion L/S=x/4x (μm) | 3 | 3 |
| 剥離時間※3<br>Stripping Time (sec.) | 13 | 18 |
| 剥離片サイズ※3<br>Stripping Flake Size | <5mm | <5mm |

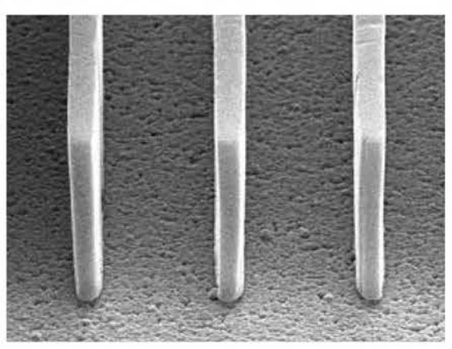
※1 現像条件 (Developing condition)：1.0%$Na_2CO_3$, 30°C, 0.10MPa, BP x 2
※2 i線プロジェクション露光装置 (i-Line Projection exposure machine)
※3 剥離条件 (Stripping condition)：50°C, Amine type, Dipping test, Test piece size: 50mm×66mm

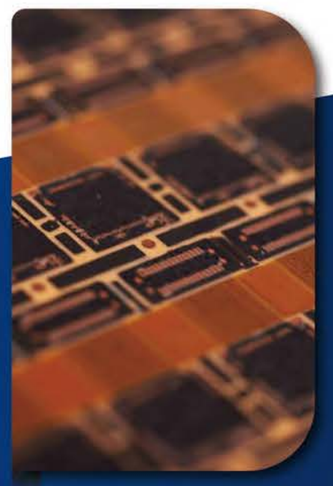
### 平滑基板上のレジスト形状
Resist Pattern on smooth substrate (Ra=50nm)

NIT8319
L/S=4/4μm



NIT8319
L/S=3/12μm





長興材料
ETERNAL MATERIALS

ALPHO® ドライフィルムフォトレジスト

# 真空RtoR対応 ALPHO® 502Jシリーズ

## For FPC patterning process ALPHO® 502J series

For Collimated

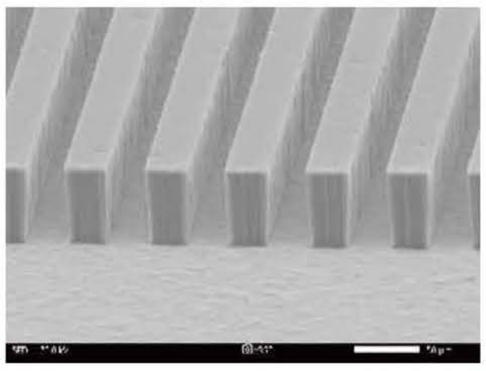
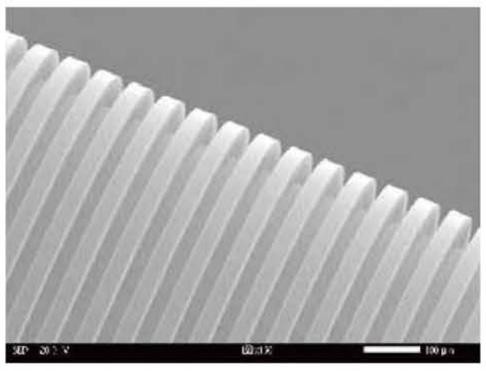
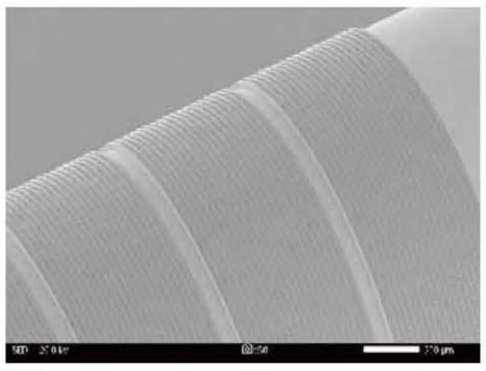
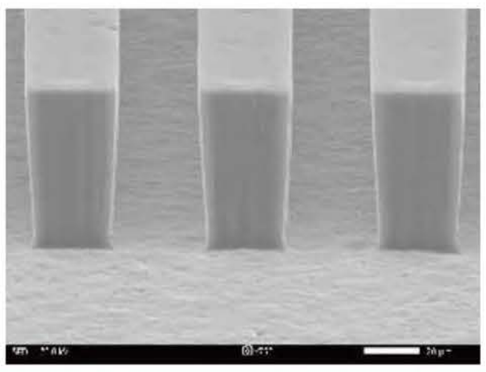
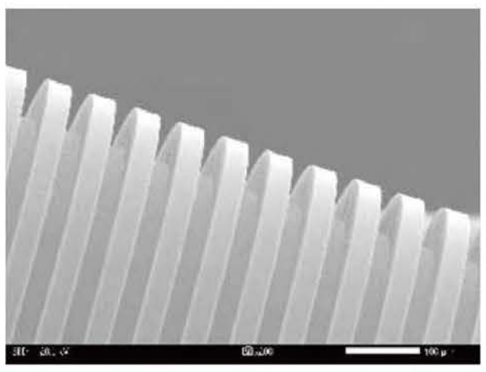
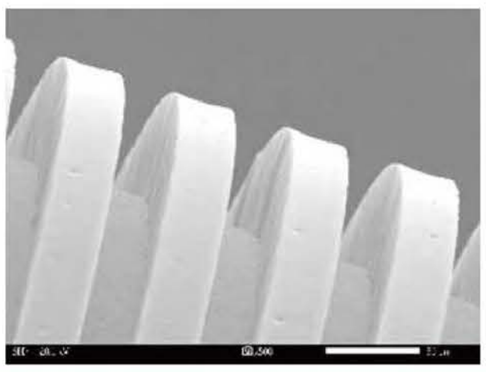
**特長 Features**

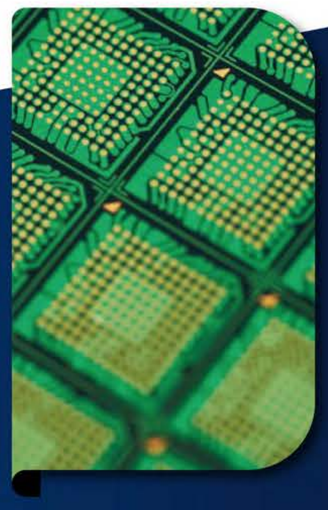
- FPCの回路形成プロセスに適合するドライフィルムフォトレジストです。
  高解像、易剥離、良好なテンティング性能、低スカム量によりファインピッチ品の量産をサポートします。
  Dry Film Photo-resist suitable for FPC patterning process. Realizing high resolution/adhesion, easy stripping, good tenting performance and low sludge/scum amount.
  Contribute to mass production for Fine pitch products.
- 真空Roll to Roll／ウェットラミネーションプロセスに適応した製品です。
  This product is suitable for vacuum roll to roll/wet lamination process.

## レジスト特性 Resist Performance

| Dry film | 502J30 | 502J60 |
|---|---|---|
| レジスト厚<br>Resist Thickness (μm) | 30 | 60 |
| 露光量※1<br>Exposure Energy (mJ/cm²) | 70 | 110 |
| 解像密着性※2<br>Resolution and Adhesion L/S =x/x (μm) | 14 | 30 |
| 細線密着性※2<br>Fine Line Adhesion L/S =x/400 (μm) | 16 | 30 |
| 剥離時間※3<br>Stripping Time (sec.) | 36 | 135 |

※1 コンタクト露光 (Collimated light exposure)
※2 現像条件 (Developing condition)：1.0%$Na_2CO_3$, 30°C, 0.15MPa, BP x 2
※3 剥離条件 (Stripping condition)：50°C, 3%NaOHaq.

| 502J60<br>L/S=30/30μm | 502J60 Folding<br>L/S=30/30μm | |
|---|---|---|
|  |  |  |
|  |  |  |



長興材料
ETERNAL MATERIALS

# ETERTEC® PR8200 Series

## Photo-Imageable Coverlay (PIC)

ETERTEC® PR8200是低溫150℃烘烤型的高精密度乾膜感光弱鹼顯像型光阻，應用於高精密度亞醯胺基板(PI)/金屬基板外層線路保護.

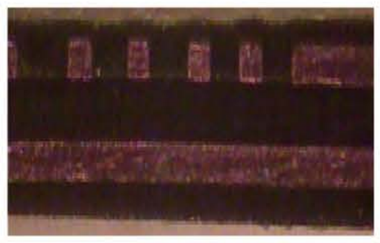
ETERTEC® PR8200 series are alkaline developable photosensitive dry film permanent photoresist of low temperature 150℃ post-bake used for the high accuracy polyimide substrate (PI) / metal substrate to protect wiring.

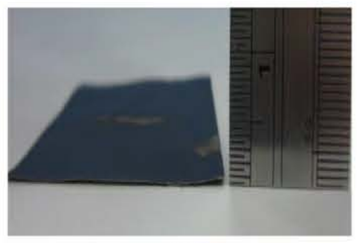
- 操作範圍寬
- 優良解析能力與結構完整性
- 底材密著性佳
- 優良耐熱焊錫性
- 優良耐化學鎳金
- 優良柔韌性與低反翹力

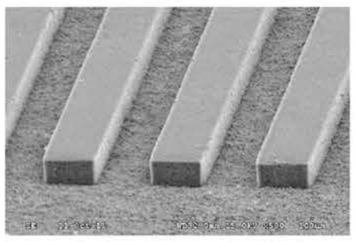
- Wide operation window
- High resolution and conformation
- Excellent adhesion to substrate
- Excellent high temperature solder resistance
- Excellent Electro-less Ni/Au plating resistance
- Excellent flexibility and low warpage / sharp memory

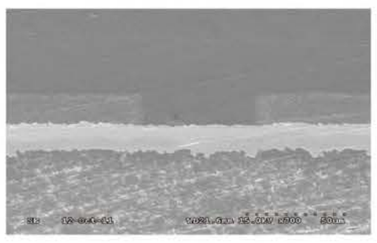
| ITEM | | ETERTEC® | |
|---|---|---|---|
| | | PR8200B1 | PR8200Y1 |
| (Applications) | | Flexible-board | |
| Color | | Matt black | Amber |
| Thickness | | 23 μm/ 30 μm/ 38 μm | |
| Solid content | | 100 wt% | |
| Shelf life | | 3 months (In dark room below 0~5 ℃) | |
| Minimum developing time<br>1%(wt) $Na_2CO_3$ aqueous solution at 30℃ | | ~50% Break point | |
| Exposure energy<br>High mercury lamp (ORC EXM-1201F 5KW) | | 250 ~ 350 mJ/cm$^2$ | 200 ~ 300 mJ/cm$^2$ |
| Recommended Eternal 21-step tablet | | 8 ~ 10 step (x / 21) | |
| Resolution | Line/Space<br>L/S=n/n (μm) | 60 μm / 60 μm | 50 μm / 50 μm |
| Resistance to bending<br>(180° x 500 g x 10 sec ) | | 20 cycles | 20 cycles |
| Warpage | | ≦1 mm | ≦1 mm |
| Cosmetic-Glossiness (60°) | | ~10 GU | 50~60 GU |

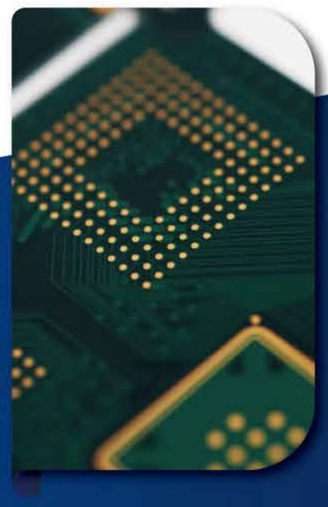
Resolution

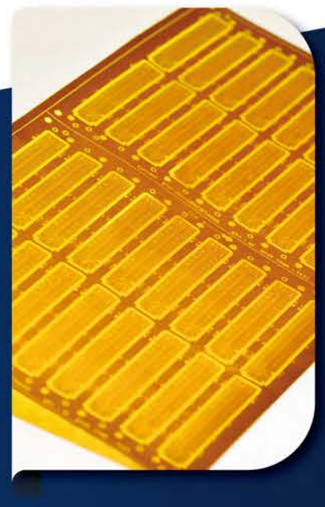

Conformation


Low warpage / Sharp-memory





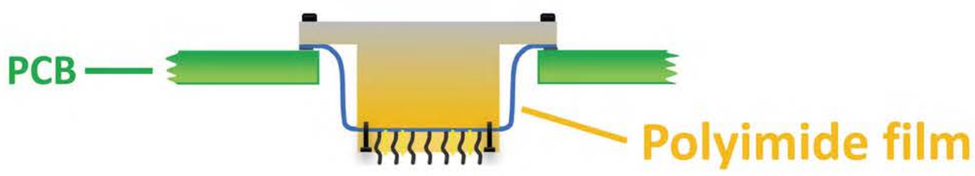




長興材料
ETERNAL MATERIALS

# 液態型聚醯亞胺於增層介電材料之應用
# ETERFLEX Polyimide as dielectric material application in build-up process

| FEATURES | 特性 |
|---|---|
| Non-photosensitive polyimide precursor | 非感光型聚醯亞胺 |
| Low viscosity with high solid content | 低黏度高固含量 |
| Low ionic/metallic impurity content | 低離子含量 |
| Excellent thermal stability | 優異的耐熱特性 |
| Excellent mechanical and electrical properties | 優異的機械與電氣特性 |

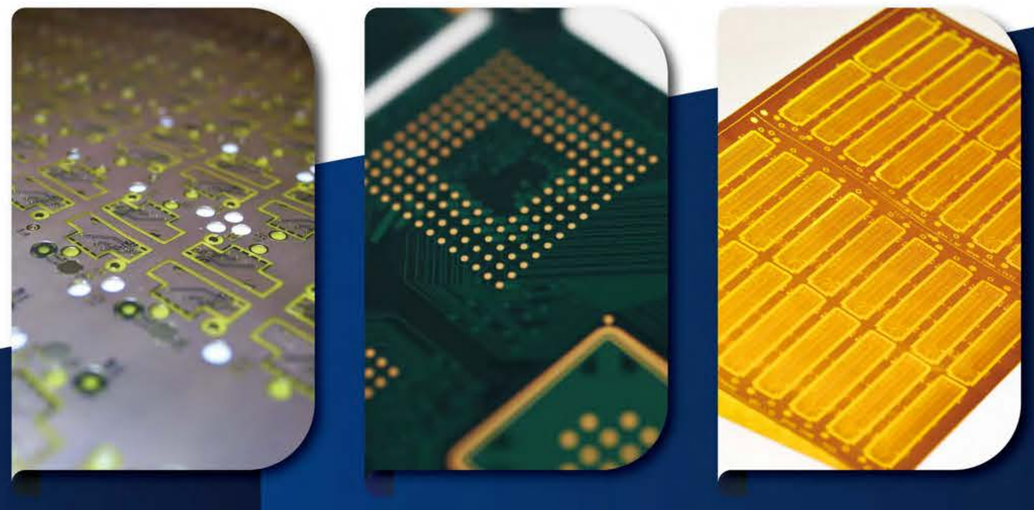



Dielectric PI material in probe card application

ETERFLEX PI as dielectric in multi-layer thin film

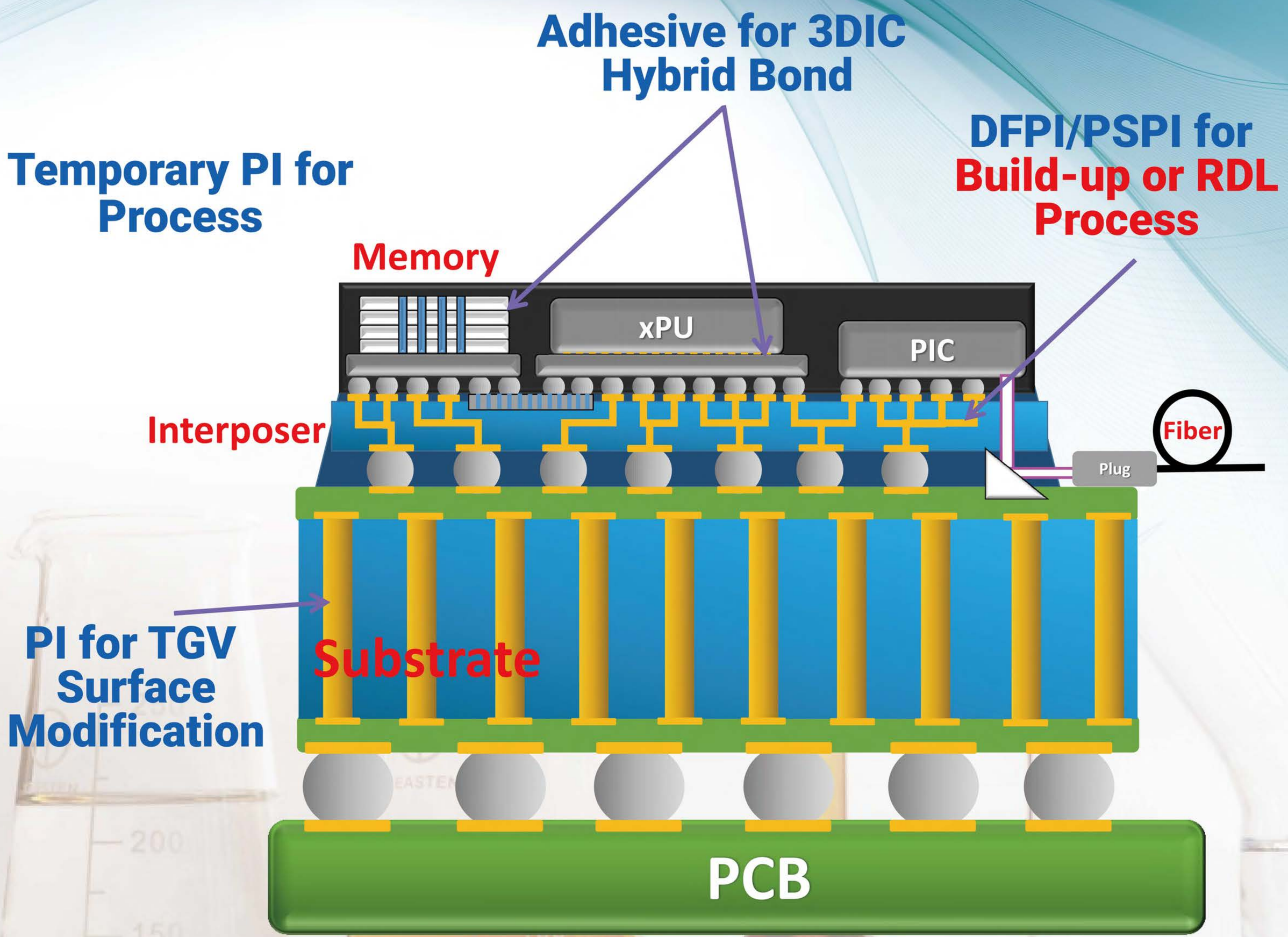
## CHARACTERISTICS

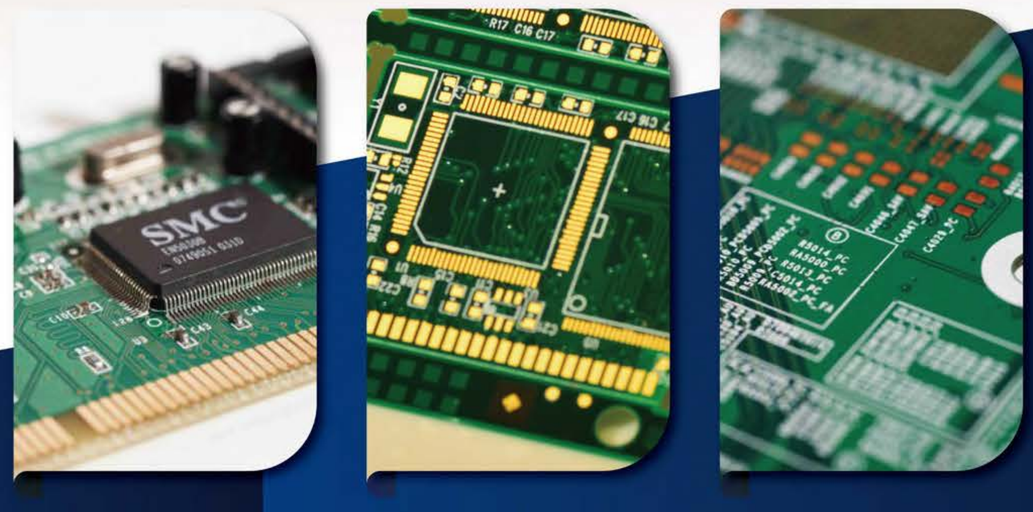
| ITEMS | Unit | ETERFLEX NP2107 series | ETERFLEX NP2404 series |
|---|---|---|---|
| 產品特色 Product feature | | Ultra low CTE | Low dielectric loss |
| 熱膨脹係數 Thermal expansion coefficient | ppm/℃ | 3－5 | 20 |
| 介電常數 Dielectric constant (10 GHz) | -- | ≦3.3 | ≦3.12 |
| 介電損耗 Dielectric loss (10 GHz) | -- | ≦0.0065 | 0.0027 |
| 抗張強度 Tensile strength | MPa | ≧350 | ≧200 |
| 楊氏係數 Young's modulus | GPa | 6.6 | >7 |
| 斷裂伸長量 Tensile elongation | % | ≧23 | ≧25 |
| 玻璃轉移溫度 Glass transition temperature | ℃ | 360 | > 400 |
| 熱裂解溫度 Thermal decomposition temperature | ℃ | ≧610 | ≧490 |
| 體積阻抗 Volume resistivity | Ω-cm | $>1.0\times10^{16}$ | $>1.0\times10^{16}$ |
| 表面阻抗 Surface resistivity | Ω | $>1.0\times10^{15}$ | $>1.0\times10^{14}$ |



長興材料
ETERNAL MATERIALS

# Glass Core Packaging Solution



長興材料
ETERNAL MATERIALS

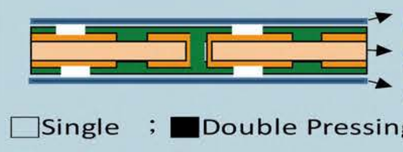
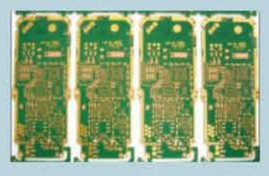
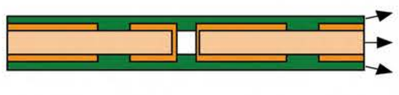
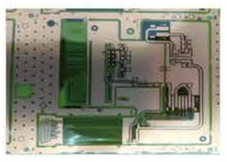
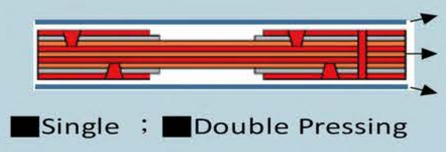
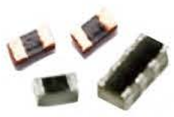
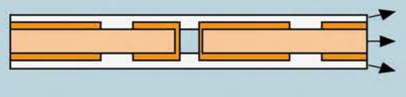
# 真空壓膜機
# EFV-1000 VACUUM LAMINATOR

## Features 特色

- High vacuum lamination prevents the occurrence of micro void
  高效能的真空壓膜方式,可以預防微小氣泡不良的產生
- High vacuum performance → 1hpa within 30sec from starting vacuum
  高效率的抽真空速度 → 抽真空開始後30秒內可以達到1hpa
- Easy operation and maintenance
  簡易的操作介面及維護保養工作
- Design with customization demand
  可配合客製化需求的設計

日本Nikko-Materials Co., Ltd. 設計

## Applications 應用

| Market | Process | Structure | Materials | Products |
|---|---|---|---|---|
| PCB/<br>FPC/<br>IC substrate | Selective Gold(OSP) Process |  <br>□Single ; ■Double Pressing | (A) Dry film<br>(B) PCB/FPC/IC substrate<br>Thickness : 0.2 ～ 2mm |  |
| FPC | PIC Process (Coverlay+Solder Mask) |  <br>□Single ; ■Double Pressing | (A) PIC film<br>(Eternal/PR82XXX,EPD33XX )<br>(B) FPC<br>Thickness : 0.1～1 mm |  |
| PCB/FPC | Rigid-Flex HDI Process<br>or<br>DF Solder Mask Process |  <br>■Single ; ■Double Pressing | (A) Dry film<br>(B) Rigid-Flex<br>Thickness : 0.2～2 mm | |
| IC/Passive Components | Dry film/DF Solder Mask Process | <br>■Single ; ■Double Pressing | (A) Dry film<br>(B) Substrate<br>Thickness : 0.3～1 mm |  |
| Mini-LED<br>Micro-LED | Backlight for Mini-LED<br>or<br>Othes Film |  <br>□Single ; ■Double Pressing | (A) DFSM or Others Film<br>(B) PCB/FPC or Display<br>Thickness : 0.3～2 mm | |

- 適用各類Film材料 → 表面有高低差壓合作業
  Suitable for Film materials
  → Laminating on Surface Pattern
- 選配預貼機系統 → 實現全自動生產線
  Optional Pre-tack system
  → Automatic Production Line

長興材料 ETERNAL MATERIALS

長廣精機 ETERNAL PRECISION MECHANICS

# 日興材料 氣囊式真空壓膜機
# Nikko-Materials Diaphragm Vacuum Laminators

## 何謂氣囊式壓膜？
## What is Diaphragm Lamination?

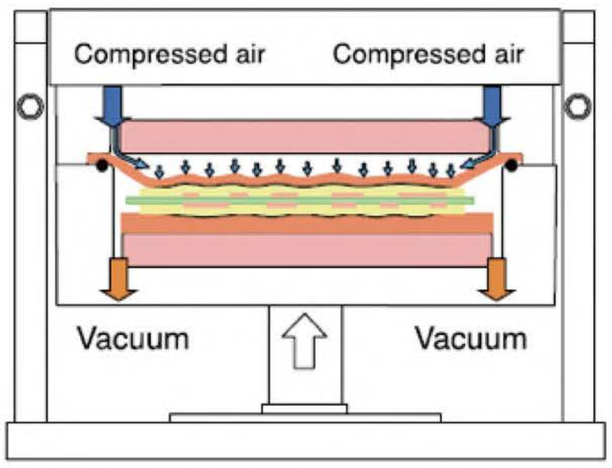
氣囊式壓膜是指通過矽橡膠的彈性變化，實現對板面凹凸、段差等的填附，並通過抽取板材與膜材料之間的空氣， 真空下消除氣泡並使膜材料與板材貼合。

採用氣壓和橡膠的方式，相較於液壓做動方式更為柔和，可適用於易碎、極薄的晶片等材料。

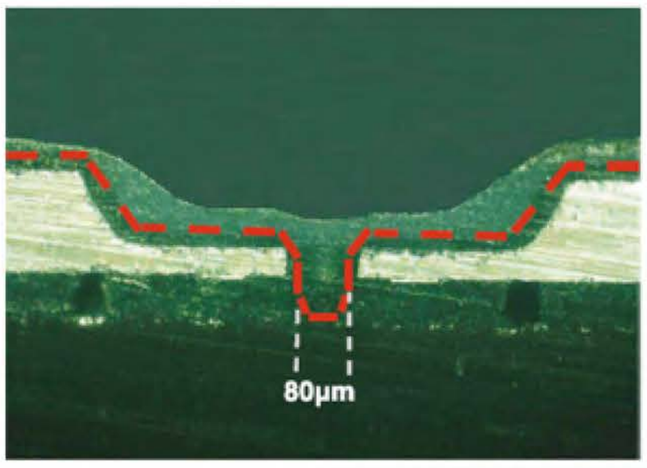
Diaphragm Lamination is to laminate with silicon rubber.

- Rubber fits uneven substrate surface, Vacuum function removes air between substrate and film, which facilitates void-free lamination.
- By using air and rubber, able to laminate soft and gently in comparison to hydraulic-powered press.

The Diaphragm type suits for various materials including fragile thin wafers.




抽真空後，從上部供給高壓空氣，從而使矽橡膠膨脹延伸、向下加壓，使膜材料與板材貼合。
Compressed air supplied to upper plate. Upper silicon rubber of diaphragm stretches downward and presses substrate with films.




對細線路、大間距段差的填附能力卓越。
Excellent conformation is guaranteed not just for fine Pattern, but for the big gap like above as well.

## 氣囊式真空壓膜機產品系列
## Diaphragm Type Vacuum Laminator Line-Up

Nikko-Materials Co., Ltd.

| Type | Model | 1st Stage | 2nd Stage | Applicable Work-Size(mm) |
|---|---|---|---|---|
| Auto | CV-300 | Diaphragm | - | 610 x610 |
| | CV-300T | Diaphragm | - | 350 x 350 (Option 400 x 400) |
| | CVP-300 | Diaphragm | Flattening Press | 510 x 510 (Option 510 x 610) |
| | CVP-300T | Diaphragm | Flattening Press | 350 x 350 (Option 400 x 400) |
| | CVP-500 | Diaphragm | Flattening Vacuum Press | 510 x510 (Option 510 x 610) |
| Manual | V-130 | Diaphragm | - | 350 x 350 (Option 400 x 400) |
| | V-160 | Diaphragm | - | 610 x 610 |

Auto type / CV-300

Auto type / CVP-300

Manual type / V-160

長興材料 ETERNAL MATERIALS

長廣精機 ETERNAL PRECISION MECHANICS

# 日興材料 橡膠壓台式真空壓膜機
# Nikko-Materials Rubber Press Vacuum Laminators

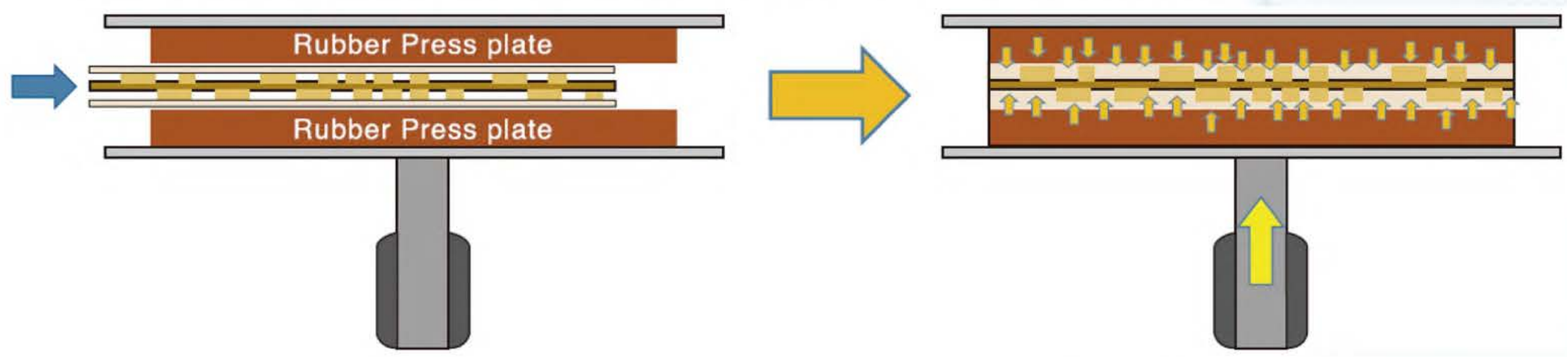
## 何謂橡膠壓台式壓膜？
## What is Rubber Press Lamination?

橡膠壓台式壓膜是指在垂直方向施加高壓，通過橡膠台面的彈性變化，讓膜材料貼着板材的凹凸變化進行壓合。在第二段進行樹酯材料表面的平整性處理。適合自動化生產作業，相較傳統多段式真空壓合生產效率更高。

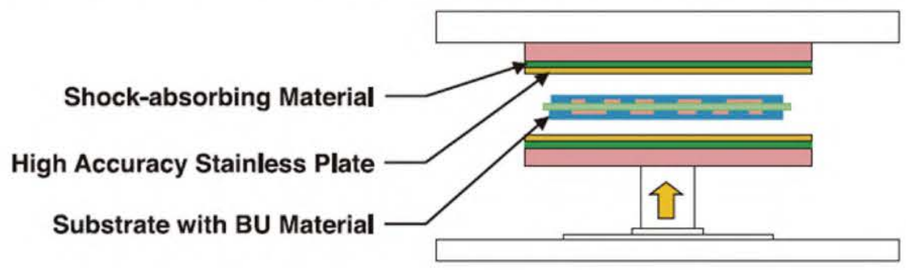
Rubber Press Lamination is to laminate with high pressure in vertical direction.
- 1 st stage /Elastic rubber press plate fits uneven substrate and conforms film.
- 2 nd stage /SUS plate press does Resin flattening.

Rubber press laminator is suitable for automation. The production efficiency is much better than Multiple pressing equipment.

### 1st 設備抽真空並透過橡膠壓台使膜材料填附板材凹凸表面。
1st Rubber Press removes air and conforms resin film to uneven surface substrate.




### 2nd 平整段實現樹脂表面的平坦性。
2nd Flattening Press finishes resin surface flat.




Data of Resin Thickness (example)

| Machine Type | Rubber Press | Diaphragm |
|---|---|---|
| Average thickness | 37.8 μm | 33.9 μm |
| Maximum thickness | 39.0 | 36.4 |
| Minimum thickness | 36.4 | 32.1 |
| Standard deviation (3σ) | 2.6 | 4.2 |

## 橡膠壓台式真空壓膜機產品系列
## Rubber Press Type Vacuum Laminator Line-Up

Nikko-Materials Co., Ltd.

| Type | Model | 1st Stage (Vacuum Laminator) | 2nd/3rd Stage (Flattening) | Applicable Work-Size(mm) |
|---|---|---|---|---|
| Auto | CV-600/700 | Rubber Press | - | 510 x 510 (Option 510 x 610) |
| | CV-600T/700T | Rubber Press | - | 350 x 350 |
| | CVP-600 | Rubber Press | Flattening Press | 510 x510 (Option 510 x610) |
| | CVP-600T | Rubber Press | Flattening Press | 350 x 350 |
| | CVP-700 | Rubber Press | Flattening Vacuum Press | 510 x510 (Option 510 x 610) |
| | CVP-1600SP | Rubber Press | Flattening Press/Servo Press | 510 x510 (Option 510 x 610) |
| | CVP-1700SP | Rubber Press | Flattening Press/Servo Press | 510 x510 (Option 510 x 610) |

Auto type /CVP-600

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**Dry Film Photoimageable Solder Mask**
乾膜防焊光阻

**Photo-Imageable Coverlay**
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