Rohm and Haas Electronic Materials is a world leader in developing innovative material solutions for the electronic and optoelectronic industries. Focused on the circuit board, semiconductor, flat panel display and advanced packaging industries, our products, technologies and solutions are vital elements in creating and producing electronic devices. Everyday, we bring inspiration, science, technology and innovation together for people around the globe. We drive the convergence of materials and innovation.

At Rohm and Haas Electronic Materials we are committed to using the breadth of our portfolio, the talent of our people, and our unparalleled ability to serve customers regardless of geography. We respond quickly to the most demanding challenges, bringing you dynamic technologies and products, exactly when and where you need them.

Rohm and Haas Electronic Materials Circuit Board Technologies has created innovative and enabling processes for the manufacture of today's most demanding board designs.

This brochure identifies Rohm and Haas Electronic Materials Brands and where they are used within the fabrication process. Moving through the innerlayer and outerlayer fabrication processes, using imaging and metallization technologies, key products are showcased to highlight the major features and benefits of these enabling processes.
Printed Circuit Process Flow
Where Rohm and Haas Electronic Materials Processes Make a Difference

- Cut material
- Punch tooling holes
- Machine brush or clean
- Apply resist for inner layer tracks
- Etch copper inner layers
- Strip resist
- Inspect
- Oxidise copper tracks
- Bond layers together
- Drill plated through holes
- Desmear drill resin
- Metallisation
- Apply plating resist
- Acid copper plate
- Tin plate or tin-lead etch resist
- Strip resist
- Etch copper
- Drill non-plated through holes
- Strip tin or tin-lead
- Apply photoimage soldermask or twin pack epoxy mask
- Apply legend ink
- Hot air solder level if required
- Solderable finish
- Profile
- Final inspection

Solderon™ Ronastan™
SURFACEstrip Film Strippers
ENVIROstrip™ Stripper
Conformask™ Soldermask
Duraposit™ SMT Electroless Nickel Pallamerse™ SMT Electroless Palladium Aurolectroless™ SMT Immersion Gold
Dry Film

LAMINAR E-7600 DRY FILM PHOTORESIST

Outerlayer

Features and Benefits
- Excellent lamination properties
- Very good tenting characteristics
- Fast and clean stripping

ALKALI ETCH—LAMINAR E-9213/LAMINAR E-8013 DRY FILM PHOTORESIST

Innerlayer—State of the Art Processing for every P & E or T & E Application

Features and Benefits
- Fine Line and High Resolution
- Fast clean processing
- Excellent lamination and adhesion
- Proven high definition Chemical Milling materials

ACID ETCH—LAMINAR E-7612/LAMINAR E-9012 DRY FILM PHOTORESIST

Innerlayer—State of the Art Processing for every P & E or T & E Application

Features and Benefits
- Fine Line and High Resolution
- Fast clean processing
- Excellent lamination and adhesion
- Proven high definition Chemical Milling materials

LAMINAR UD-700 DRY FILM PHOTORESIST

Laser Direct Imaging (LDI)

Features and Benefits
- Fast photo speed
- Straight sidewalls
- Superior adhesion
- Resistant to acid and alkaline etching
- Good resistance to acid plating chemistry

LAMINAR E-9200/LAMINAR E-8000 DRY FILM PHOTORESIST

Multi-functional

Features and Benefits
- Capable of 1-to-1 resolution
- Excellent performance in gold plating
- Good donut and isolated resist adhesion
- New! 2.5 mil (63µ) and 3.0 mil (75µ) thicknesses for heavy plating and special applications
NIT Family

Advanced Features and Benefits
- High yield rate @ 8 µm coating thickness
- Excellent abrasion resistance
- Low exposure energy of 40 mJ/cm² with Cu step 7–8
- >72 hrs stackability

PHOTOPOSIT SN66 LIQUID PHOTORESIST

Description
A new photo polymer technology provides extremely high yield rate with a wide and flexible operating window, Photoposit SN66 photoresist will renew your vision on liquid photo resist technology.

Features and Benefits
- High resolution with 25–50 µm L/S
- Wide Operating window in drying and stripping process
- Less resist residue after stripping
- Compatible with a wide range of roller coasters

50 µm Line/Space Resolution

FOD Test
Advanced Innerlayer Bonding Technology

CIRCUBOND 2200 PLUS OXIDE REPLACEMENT

**Features and Benefits**
- High reliability on wide range of high performance laminate
- Market leader in Japan, USA, SEA and China
- Lead free application is satisfied
- Widest application range and all kinds of laminate compatibility
- Best performance on high layer counts application
- Individual chemicals analysis and control with a wide and stable process control window
- High peel strength on high Tg epoxy based laminate
- Most stable process control and very long bath life
- Controllable weight gain for CO2 direct laser application
- Low roughness control to reduce signal reflection at high frequency signal

288C Solder Dipping Test
- Excellent Thermal Reliability
- Excellent Peel Strength

![288C Solder Dipping Test Graph]

Peel Strength
- ![Peel Strength Graph]

3D Surface Profile
- Ra 0.34um; Rz 3.8um

PROBOND OXIDE

**Features and Benefits**
- Market leader in Japan, USA, SEA and China
- High peel strength on high Tg epoxy based laminate
- Widest application range and all kinds of laminate compatibility
- Best performance on high layer counts application
- Most stable process control and very long bath life
- Controllable weight gain for CO2 direct laser application

PB484 Oxide Weight vs. Dwell Time
- ![PB484 Oxide Weight vs. Dwell Time Graph]

SEM Comparison
- Before Converter
- After Converter
**Desmear/Electroless Copper for Semi Additive Process**

**CIRCUPOSIT 7800 PRODUCT SERIES**

**Features and Benefits**
- Uniform and stable adhesion promotion treatment with reliable via bottom cleaning
- Stable and wide process window
- High peel strength and optimum surface roughness for Resist adhesion
- Excellent plating coverage on insulator and microvia
- Excellent electrical reliability with high insulation resistance

**Key issue for SAP**
- Electroless Copper Plate
  - Deposit Grain Size
  - Leveling for Roughness (void in anchor)
- Solder Mask
  - Electrical Reliability
  - Physical / Thermal Property
  - Flatness
- Insulator
  - Roughness
  - Metallization
  - Pd/Sn Residue
  - Cu Residue

**Process Flow**
- Circuposit 7810 Sweller
- Circuposit 7820 Permanganate
- Circuposit 7830 Neutralizer
- Circuposit Cleaner/Conditioner
- Circuposit Microetch
- Circuposit Pre Dip
- Circuposit Catalyst
- Circuposit Accelerator
- Circuposit Electroless Copper

**Adhesion Promotion on Insulator**

**Via Bottom Cleaning**

**Excellent Plating Coverage**

**Cu-Cu Connection**

**Via Peel Test**

*Graph showing force in lbf/in vs. path in in.*
Making Holes Conductive

CIRCUPOSIT 3000-1 UNIVERSAL ELECTROLESS COPPER

Features and Benefits
- Low-build or high-build deposit
- Vertical or horizontal application
- A universal electroless copper process
- Chemistry volumes reduced by up to 40%
- Catalyst strength reduced by 50%
- Increased thermal cycle reliability
- Steady state operation
- Designed for today’s materials
- Exceptional performance and reliability
- Global reference list

Chemistry Volume

New Bath

Cycled Bath

Steady State Performance

Reliable microvia connections drive yield and performance
CIRCUPOSIT 3000-1 UNIVERSAL ELECTROLESS COPPER

Features and Benefits
- A universal electroless copper process
- Chemistry volumes reduced by up to 40%
- Catalyst strength reduced by 50%
- Increased thermal cycle reliability
- Steady state operation
- Designed for today’s materials
- Exceptional performance and reliability
- Global reference list

Process Flow

Circuposit Cleaner/Conditioner
Circuposit Microetch
Circuposit Predip
Circuposit Catalyst
Circuposit Electroless Copper 3350-1

Electroless Copper Deposit: Conventional
Electroless Copper Deposit: C-3000-1 (fine grain)

Ultimate in PTH reliability
Excellent coverage in MicroVia

COPPER GLEAM PPR-H HORIZONTAL ACID COPPER

Features and Benefits
- Acid copper plating for pulse period reverse power supply
- Improved throwing power by PPR plating
- Sequential process enabled with horizontal line
- Applicable to thin boards overcoming racking and handing issues
- Improved working environment with closed system
- Insoluble anodes provides easy maintenance
Copper Gleam XP-6339 plating products are used in DC pattern plate process for microvia filling. This can be applied to HDI construction in PWB fabrication and for IC Substrate fabrication.

Features and Benefits
- Good in fine line pattern plating and microvia filling
- Rectangular track profile, good for wire-bonding
- Suitable for insoluble anode and impingement system
- Two component system, easy to control
- Fully analyzable additive system

Microvia Dimple Depth

Convex Track vs. Plating Thickness

Microvia dia/depth: 70 µm/35 µm
Plating Thickness: 18 µm
Current Density: 2.0 ASD
COPPER GLEAM HT-55 DC COPPER PLATING

Features and Benefits
- High throwing power
- Vertical Rack or VCP operation
- DC operation

- Exceptional surface distribution
  - Reduced plating time
  - Reduced average surface copper
  - Reduced soldermask thickness

Maximum Track Height

Difficulty Factor

% TP

0 10 20 30 40 50 60 70 80 90 100

0.05 0.13 0.21 0.26 0.36 0.48 0.58 0.81

2 ASD 4 ASD 6 ASD

Maximum Track Height

Microns

0 20 40 60 80 100 120

Old Style Acid Copper Typical Acid Copper Pulse Plate HT-55
Acid Copper for Vertical Continuous Plater

ST901 FOR VERTICAL CONTINUOUS PLATER

Features and Benefits
- Suitable for soluble anodes in vertical continuous plater
- Excellent throwing power in substrates with a high aspect ratio
- Excellent Thermal Shock resistance by means of high elongation and low stress
- Easily controlled by CVS analysis

Diff. Thickness vs. Hole Width

<table>
<thead>
<tr>
<th>Hole Width (mil)</th>
<th>10</th>
<th>14</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP (%)</td>
<td>120</td>
<td>100</td>
<td>80</td>
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</table>

Panel Thickness | Hole Diameter | A/R | Throwing Power
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8 mm</td>
<td>0.1 mm</td>
<td>8</td>
<td>91.91% 83.10% 72.11%</td>
</tr>
<tr>
<td>0.8 mm</td>
<td>0.2 mm</td>
<td>4</td>
<td>96.60% 93.20% 81.98%</td>
</tr>
<tr>
<td>0.6 mm</td>
<td>0.2 mm</td>
<td>3</td>
<td>96.15% 97.30% 88.88%</td>
</tr>
</tbody>
</table>

HS201 FOR VERTICAL CONTINUOUS PLATER

Features and Benefits
- Suitable for insoluble anode in vertical continuous plater
- Excellent throwing power in substrates with a high aspect ratio
- Excellent Thermal Shock resistance by means of high elongation and low stress
- Easily controlled by CVS analysis
- Two-component additive, very stable in acid copper plating bath
- High current density operation above 30 ASF

<table>
<thead>
<tr>
<th>Item</th>
<th>0.25 mm</th>
<th>0.30 mm</th>
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<tbody>
<tr>
<td>Panel Thickness</td>
<td>64 mil</td>
<td>64 mil</td>
</tr>
<tr>
<td>A/R</td>
<td>6.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Surface</td>
<td>0.518</td>
<td>0.525</td>
</tr>
<tr>
<td>Hole</td>
<td>0.420</td>
<td>0.437</td>
</tr>
<tr>
<td>TP%</td>
<td>81%</td>
<td>83%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Via Diameter</th>
<th>A/R</th>
<th>Current Density</th>
<th>Throwing Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mil</td>
<td>0.75</td>
<td>40 ASF</td>
<td>102%</td>
</tr>
<tr>
<td>5 mil</td>
<td>0.6</td>
<td>40 ASF</td>
<td>105%</td>
</tr>
</tbody>
</table>
High Performance
PPR Electroplating Products

COPPER GLEAM CUPULSE PPR COPPER ELECTROPLATING

Features and Benefits
- Versatile PPR plating system
- High aspect ratio and mixed technology capability
- Unique analytical tools to maintain consistent performance

6.15 DF
0.400 in. Thick / 0.026 in. Dia
7 hr. @ 8 ASF; 73% Throw

4.50 DF
0.300 in. Thick / 0.020 in. Dia
6 hr. @ 10 ASF; 73% Throw

2.90 DF
0.187 in. Thick / 0.012 in. Dia
120 min. @ 15 ASF; 92% Throw

0.64 DF
0.093 in. Thick / 0.0135 in. Dia
90 min. @ 20 ASF; 97% Throw

Image courtesy of TTM Technologies

Image courtesy of DDi Corporation
Final Finish ENIG Technology

DURAPOSIT SMT 88 ELECTROLESS NICKEL

Features and Benefits
- Excellent bath stability
- Highly durable and uniform
- Elimination of nickel corrosion
- No skip plating
- Compatible with electroless Pd

No “Black Pad” Corrosion

No Skip Plating

Ni/Au Depth vs. Composition

AUROLECTROLESS SMT 250 IMMERSION GOLD

Features and Benefits
- Excellent adhesion
- Excellent solder wetting
- Superior nickel protection
Final Finish ENEPIG Technology

DURAPOSIT SMT 88 ELECTROLESS NICKEL/PALLAMERSE SMT 2000
ELECTROLESS PALLADIUM/AUROELECTROLESS SMT-250 IMMERSION GOLD

Features and Benefits

- Proven production process and bath stability
- Universal finish
  - Aluminum and gold wire bonds
  - BGA’s
  - SnPb and Pb-free compatibility
- Excellent IMC characteristics
- Superior solder wetting
- Durable wear resistance
- RoHS compliant

Ni/Pd/Au Depth vs. Composition

No P rich Layer

Before Gold Strip

After Gold Strip

ENEPIG (Au = 0.05 microns)

Ball Pull Strength of Ni/Pd/Au

www.rohmhaas.com
Circuit Board Technologies

CMP Technologies

Display Technologies

Microelectronic Technologies

Packaging and Finishing Technologies

For locations and information please visit www.rohmhaas.com

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