DURAPOSIT™ SMT 88 Electroless Nickel System
For PWB Metallization Applications

**Regional Product Availability**
- N. American
- Japan/Korea
- Asia

**Description**
DURAPOSIT™ SMT 88 is an electroless nickel system specifically formulated for use in combination with AUROLECTROLESS™ Immersion Gold baths or PALLAMERSE™ Electroless Palladium baths. DURAPOSIT SMT 88 produces a bright uniform ENIG or ENEPIG deposit on properly prepared PWB substrates.

The bath is designed to produce a deposit with a phosphorus content approximately 8.5–9.5 (measured by ICP-AA).

Plating performance is maintained at both high and low bath loading and the concentrated replenishment components minimize bath volume growth during usage.

The self-adjusting pH feature simplifies bath operation and makes the process an excellent choice for use with Dow Electronic Materials automatic bath control systems.

**Bath Concentrates**
DURAPOSIT™ SMT 88 Electroless Nickel System is a three-component system. Two concentrates are used to make up the bath (DURAPOSIT SMT 88 M and DURAPOSIT R), while DURAPOSIT R and DURAPOSIT SMT 88 S are used for replenishment.

**Plating Tank Preparation**
Prior to make-up of a DURAPOSIT™ SMT 88 Electroless Nickel bath, the plating tank, pumps, pump lines and heaters should be cleaned, neutralized and rinsed with deionized (D.I.) water. The tank, pumps and heaters should be stripped with 30–50% nitric acid, rinsed thoroughly, neutralized with a 1% solution of ammonium hydroxide or potassium carbonate, drained, and rinsed with D.I. water. Filter bags or cartridges should be leached and rinsed in hot D.I. water before use.

**Bath Make-Up (100 Gallons)**
- D.I. Water: 85 gallons
- DURAPOSIT™ SMT 88 M Electroless Nickel: 10 gallons
- DURAPOSIT R Electroless Nickel: 5 gallons

The D.I. water should be added to the tank first, followed by DURAPOSIT SMT 88 M Electroless Nickel. After these solutions are thoroughly mixed, DURAPOSIT R Electroless Nickel should be added. Following complete mixing, the solution may be analyzed and any necessary adjustments made.

**Plating Rate**
The plating rate of a freshly made-up bath, at 190°F (88°C), is approximately 0.6 mil/hour. At a rate of 0.6 mil/hour and a bath loading of 1.0 ft²/gallon (2.45 dm²/liter), the bath nickel concentration will deplete approximately 45% per hour.
**Bath Operation**

Temperature: DURAPOSIT™ SMT 88 Electroless Nickel baths may be operated between 180–195°F (82–91°C). Optimum temperature is 188°F (87°C).

Agitation: Solution recirculation agitation is recommended. Side to side movement of the plating rack, together with bump agitation is preferred.

Filtration: Continuous filtration through 5–10 micron filter bags or cartridges is recommended. Whenever the bath is transferred from one tank to another, batch filtration through a 3 or 5 micron filter bag is recommended.

Nickel Concentration: For optimum bath operation, nickel concentration should be maintained at a bath strength between 90–105%.

pH: DURAPOSIT SMT 88 Electroless Nickel will make up at a pH of 4.8. During operation, the pH should be maintained between 4.6 and 5.0. If necessary, the pH may be adjusted upwards with either dilute aqueous ammonia or filtered liquid potassium carbonate, or downwards with dilute (10–20 vol%) sulfuric acid.

Loading: Maintain a minimum work load of 0.1 ft²/gal. (0.24 dm²/L). With manual replenishment, a maximum of 1.0 ft²/gal. (2.45 dm²/L) should be used. Use of an automatic controller will allow the use of higher loadings. Bath loading should be calculated based on total exposed copper surface of the PWBs to be processed, including both surface pads and through-holes.

Incoming Work: In order to ensure optimum process performance, it is important to ensure that PWBs entering the ENIG process have been properly prepared. All residues of metal resist (tin or tin-lead) must be completely removed, compatibility of the solder mask confirmed and proper cure and registration of solder mask ensured.

**Bath Control And Replenishment**

**Nickel Analysis Procedure**

I. **Principle**

DURAPOSIT™ SMT 88 Electroless Nickel baths are maintained by additions of 1 part DURAPOSIT SMT 88 R to two parts of DURAPOSIT SMT 88 S, based on regular analysis of nickel metal concentration.

II. **Reagents**

a) Ethylenediaminetetraacetic acid (EDTA), 0.05M
b) Concentrated ammonium hydroxide
c) Murexide indicator (0.2g murexide ground with 100g sodium chloride)

III. **Procedure**

a) Pipette a 5 mL sample of DURAPOSIT SMT 88 Electroless Nickel bath [cooled to 100°F (38°C) or lower] into a 250 mL Erlenmeyer flask. The bath must be at working volume when the sample is taken.

b) Add 50 mL of distilled water.
c) Add 5 mL of ammonium hydroxide.

d) Add 0.2g murexide indicator.

e) Titrate with 0.05M EDTA from a pale-yellow to a purple end point.

f) Record the number of mL of EDTA titrated.

IV. Calculation

\[ \text{mL 0.05 EDTA} \times 9.62 = \% \text{Nickel Concentration} \]

*For other EDTA concentrations use:

\[ \text{mL of EDTA} \times \text{M of EDTA} \times 192 = \% \text{Nickel Concentration} \]

<table>
<thead>
<tr>
<th>% Nickel Conc.</th>
<th>g/L (as metal)</th>
<th>mL 0.05M EDTA</th>
<th>DURAPOSIT R (mL)</th>
<th>SMT 88 S (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105</td>
<td>6.4</td>
<td>10.9</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>100</td>
<td>6.1</td>
<td>10.4</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>95</td>
<td>5.8</td>
<td>9.8</td>
<td>950</td>
<td>1,900</td>
</tr>
<tr>
<td>90</td>
<td>5.5</td>
<td>9.4</td>
<td>1,900</td>
<td>3,800</td>
</tr>
<tr>
<td>80**</td>
<td>4.9</td>
<td>8.3</td>
<td>3,800</td>
<td>7,600</td>
</tr>
<tr>
<td>70</td>
<td>4.3</td>
<td>7.3</td>
<td>5,700</td>
<td>11,400</td>
</tr>
<tr>
<td>60</td>
<td>3.7</td>
<td>6.3</td>
<td>7,600</td>
<td>15,200</td>
</tr>
</tbody>
</table>

**If % nickel concentration falls below 85%, make the required additions in two portions, separated by at least 5 minutes. Make additions slowly and away from plating parts.
Handling Precautions

Before using this product, or the analytical reagents required for this control, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on material hazards, recommended handling precautions and product storage.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Electronic Materials Technical Representative for more information.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.