NB SUNNISI 100

Silicon porosification and nickel sulfamate process

INTRODUCTION

NB sunNiSi 100 is a silicon porosification process and nickelsulfamate electroplating process. Major purpose is to fill porous silicon pore with nickel. The plating process produces a pure, ductile, fine-grained, semi-bright low stress nickel deposit. NB sunNiSi 100 is applied for porosification and electroforming of microstructured wafers (Micro System Technology).

NB sunNiSi 100 is released as product with preliminary status and still under development.

SAFETY NOTE:

The product contains fluoride and free hydrofluoric acid. Solutions containing flourides have to be handled with maximum caution due to poisonous hazardous impact.

Always comply with hazard information, local safety regulations and safety recommendations of the material safety datasheet.

FEATURES/BENEFITS

- Silicon nanopore generation
- Deposit of nickel in/on porous silicon
- Pure nickel depositions
- High ductile plating
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NB sunNiSi 100 components

NICKELSULFAMAT E SOLN 185 G/L NI
SUNNISI 100 WETTING AGENT
AMMONIUM BIFLOURIDE
AMMONIUM FLOURIDE
BORIC ACID
SULPHAMIC ACID

READY FOR USE SOLUTION

The NB sunNiSi 100 is shipped as ready-for-use solution.

EQUIPMENT

TANKS

Tanks made of temperature resistant polymers such as PP, PE, PTFE or glass are recommended materials. First they have to be leached, the best overnight or over the weekend with ca. 5-10% caustic soda solution at approx. 50°C, rinse with deionised water and neutralised with ca. 5% sulphamic acid.

HEATING

The process is performed at room temperature.

ANODES

Anode material: S-Ni-Pellets (∅6-13 mm) or S-Ni-Rounds (∅21 mm).
New anode bags have to be leached out. Do not introduce anode bags used before.
NO titanium basket or titanium material may be used, as this will attacked by hydrofluoric acid.

FILTRATION

Continuously, e.g. with filter cartridges (1-10 µm pores); filtration capacity at least 1 volume per hour. Tube connections should be made of fibre strengthened polymer.

AGITATION

Use medium, uniform agitation.

RECTIFIER

Sufficient to provide the necessary direct current with less than 5% ripple.

OPERATING CONDITIONS

	Optimum	**Range**
Nickel metal	17 g/l	12 – 22 g/l
Boric acid	15	10 – 20 g/l
pH	4.0	3.5 to 4.5
Temperature	RT	25 to 30°C
Cathodic current density	1 A/dm²	0.5 to 1.5 A/dm²
Anodic current density	1 A/dm²	0.1 to 1.5 A/dm²
Anode to cathode surface		minimum 2 : 1
Agitation of the electrolyte	medium	

MAINTENANCE OF THE SOLUTION

Temperature

Maintain the temperature of the plating solution between RT and below 30°C. Higher temperatures will effect higher rate of HF evaporation.

pH control

Maintain the pH of the solution between 3.5 and 4.5. High pH values result in less ductile Ni deposits and may hinder the porosification process, lower pH values are preferred for porosification but may cause lowered plating efficiencies. The best results are obtained at pH 4.0. Use only reagent grade sulphamic acid to lower the pH and high purity nickel carbonate to raise the pH. Do not add nickel carbonate directly to the solution. Either make a slurry with a portion of the solution and add to sump or weir or fill an anode bag and hang it in the solution where solution movement is good.

NICKEL CONCENTRATION

Nickel sulphamate solution contains 185 g/l nickel metal. This solution is used for compensation of consumed drag-out losses. As soluble anodes are used, nickel concentrations should not drop, so compensation is needed for drag out losses mainly.

BORIC ACID

Boric acid serves as a buffer to prevent variations in solution pH during the plating cycle. It also reduces the tendency toward burning at higher current densities and should be maintained at optimum for best results. Higher concentrations of boric acid do not disturb the process, however, at lower temperatures, boric acid tends to fall out if concentration is at 40g/l. Therefore, the concentration should not exceed 20g/l, if precipitates are problematic.

HF CONCENTRATION

HF concentration is maintained using ammonium biflouride and ammonium flouride. Adding both components in molar ratios will also have buffering effect and keep the pH value stable.

HF content drops due to consumption at porosification. Presently, there is no analysis recommended by NBT. Excess drop of HF content may lead to the reduction of the applicable porosification current density, electropolishing would occur at lower current densities when HF content is reduced. NBT recommends Hull cell experiments for porosification using silicon substrates.

If electropolishing is observed at 1A/dm² then add 14g/l ammonium biflouride and 9g/l ammonium fluoride.

WETTING AGENT

The wetting agent concentration should be maintained at 4 to 8ml/l. There is no major loss of wetting agent in operation. Add wetting agent in 1ml/l steps, if wetting is observed to be reduced. Overdosing up to 16ml/l will not harm the solution.

SPECIFIC PROCEDURES

- Oxygen plasma before plating
- chemical pre-treatment not recommended/normally not needed
- Cleaning of all items with DI before insertion in electrolyte
- Wetting of wafer surface with DI water before insertion into bath (check for wetting)

CUSTOMER SUPPORT

Further customer support on the process with this product is available by contacting NB Technologies GmbH.

BATH ANALYSIS SERVICE

NB Technologies supports the bath analysis and provides special shipping kits including shipping box, sample bottles and labels.

DATA LOGGING

Keep a record of ampere-hours of use to determine replenishment volumes. Examples of process log sheets are available by contacting NB Technologies GmbH.

HANDLING AND SAFETY INSTRUCTIONS

For detailed information consult the material safety data sheets for this product.
Please read material safety data sheets carefully before using this product.

DISCLAIMER

All recommendations and suggestions in this bulletin concerning the use of our products are based upon tests and data believed to be reliable. Since the actual use by others is beyond our control, no guarantee expressed or implied, is made by NB Technologies GmbH, its subsidiaries of distributors, as to the effects of such use or results to be obtained, nor is any information to be construed as a recommendation to infringe any patent.

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