NB SEMIPLATE PD 200

Pd electroplating process

INTRODUCTION

NB SEMIPLATE PD 200 is a neutral/weak alkaline electroplating formulation which produces a shiny deposit up to 1.5µm thickness. The deposits show good adhesion and low stress. NB SEMIPLATE PD 200 deposits have main applications in MEMS processing.

"NB SEMIPLATE PD 200" is shipped **ready-for-use**, while the "**PD 200** xxx" are compounds and used for maintenance.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT.

PHYSICAL PROPERTIES OF THE DEPOSIT

Purity	99.9%
Density	12g/cm³

MATERIALS REQUIRED

Product Name	Product code	Comment
NB SEMIPLATE PD 200	211200-00	• ready-for-use solution • contains 3g/l Pd
PD 200 R1	211200-30	• Replenisher R1
PD 200 R2	211200-40	• Replenisher R2
PD 200 X COMPLEX	211200-20	• Pd complex (50g/l)
Ammonia (reagent grade, e.g. 25% by weight)		• required to raise the pH

EQUIPMENT REQUIRED

Tanks (liners)	Polypropylene, CPVC, unfilled PVC, and plexiglass are recommended. Viton is a recommended gasket material. If any questions arise as to material compatibility, consult NB Technologies.
Leaching	Degrease/leach all tanks and peripheral equipment thoroughly prior to installation of this process.
Heating	PTFE, glass
Filtration	Continuous filtration is required. Fiberglass or cellulose can be used toobtain a clear filtrate after carbon treatment. Use properly leached Dynel, or polypropylene filter cartridges. Filter cartridges should be soaked in sodium hydroxide at 60°C for some hours and then rinsed well in DI water. Finally, the cartridges shall be soaked in 25% ammonia.
Rectifiers	Sufficient to develop more than the greatest direct current required with less than 5% ripple at the amperage used.
Anodes	platinated titanium
Ventilation	required, exhaust according to local regulations

BATH PARAMETERS

The following table shows the bath parameters, which should be maintained and checked with regular sample analysis.

	NBT analysis	Units	Max. upper limit	Upper action limit	Optimum	Lower action limit	Lowest limit
Pd	X	g/l	4	3.5	3	2.5	2
PD 200 R1	-	ml/l	-	-	-	-	-
PD 200 R2	-	ml/l	-	-	-	-	-
pH	(X)	pH	8	7.9	7.8	7.7	7.6

The replenishers R1 and R2 are normally not required to be analyzed. R1 and R2 are replenished along with Pd replenishment (see below).

GENERAL PLATING CONDITIONS

Parameter		**Optimum**	**Range**
Cathode current density	[mA/cm²]	10	3 – 15
Flow depending on tool	[l/h]	-	1200 –
Anode to cathode spacing (depends on tool and wafer size)	[cm]		5 - 15
Temperature	[°C]	45	30 to 60

Current yield: 25mg/Amin

MAKE-UP PROCEDURE

The solution is delivered ready for use. No make-up procedure is needed.
PLEASE NOTE: The pH may be higher than nominal at delivery, please refer to the pH-control section below.

SPECIFIC REQUIREMENTS

- Fixtures and anode should be operated in symmetric conditions to the wafer centre (distance of wafer edge to fixture edge, distance of fixture to tank wall, electrical contacting)
- Anode material platinated titanium
- Fixture and others features of PP, PFTE, POM or compatible-proven materials (degreased, leached)

OPERATION

The plating surface should be cleaned well from grease or any other residues by proper pretreatment. In order to achieve optimum results regarding adhesion and ductility, a Pd strike can be applied in a separate bath. Consistently optimum deposits from the NB SEMIPLATE PD 200 process are achieved through conscientious process control. Continuous filtration, vigorous mechanical (not air) agitation and good temperature control are important as well as careful rinsing techniques. In order to maintain the brightness after plating, thorough rinsing must be performed. As a recommendation, the plated substrate may be soaked in hot water (80 to 90°C) for a period of 5 to 10 minutes before drying.
Brightness of the deposit from the NB SEMIPLATE PD 200 process must be maintained. A dull deposit is indicative of process imbalance or organic contamination.

Process guideline

	Too low	Too high
Pd content	Burned surface	no impact
pH	matte, stained deposit	low impact
temperature	matte deposit	reduction of Pd metal
current density	no impact	burned surface
agitation	defective shininess	no impact

MAINTENANCE

Routinely analyze the plating solution for Pd concentration to determine the need for replenishment or to verify the accuracy of a replenishment schedule based upon Amin of use. NB Technologies offers bath analysis service and sample kits for shipping.

Pd concentration

Actions on Au concentration according to analysis:

- o At lower action limit, at lowest limit at the latest, add correspondent amount of Pd to the bath
- o At upper action limit reduce adding of Pd on Amin-basis
- o At maximum upper limit stop adding of Pd on Amin-basis

Replenishment of Pd according to analysis:

- o 20ml PD 200 X Complex per 1g of Pd to be added

Replenishment of Pd on Amin basis:
Beside analysis result, Pd can be replenished on the basis of Amin plated.
Example of 1 liter bath: Every plated 20Amin replenish

- o 10ml of PD 200 X Complex (0.5 g Pd)

PD 200 R1/R2

The replenishment of PD 200 R1/R2 is performed along the replenishment of Pd metal. Add 5ml PD 200 R1 and PD 200 R2 each per g Pd added to the solution.

pH control and adjustment

During operation the pH tends to drop. pH **MUST** never drop lower than 7.5, otherwise the bath may produce precipitates (which can be dissolved at pH increase again). Proper operation is provided in the specified

range only. For raising the pH use reagent grade ammonia and add carefully while stirring in small amounts. At pH above 8, let the solution be heated in idle state until the pH has dropped again by evaporation of ammonia. For long term storage, the pH can be raised to a level of 8.5 to 9.0, in order to prevent precipitates due to pH drop over time.

Carbon filtering
In order to remove organic contaminations as per analysis or by suspect, organic cleaning and carbon filtering may be applied in principle. After the procedure, analysis and replenishment of the additives is required. Regular carbon filtering is not recommended. Contact NB Technologies for technical assistance.

Impurities
Introduction of organic impurities into the solution should be prevented by proper rinsing of the parts to be plated. The NB SEMIPLATE PD 200 process is relative tolerant to low levels of heavy metal contaminants, as it will co-deposit these metals without serious effect upon either the appearance or physical properties of the deposit. Organic impurities may be dragged into the plating solution from a variety of sources and will usually result in a significant decrease of brightness or dull appearance.

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.
NB SEMIPLATE PD 200 contains ammonium salts and has slightly alkaline pH. During operation ammonia is evaporated, therefore, exhaust ventilation is mandatory. Used bath solutions have to be disposed according to local regulations.

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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