SCHEDA TECNICA

PDSTARK-FE

PALLADIUM-IRON: MICRON AMMONIA FREE DECORATIVE ELECTROLYTE

DESCRIPTION

PDSTARK-FE is a Palladium - based process that uses iron to generate an alloy with a reflective, glossy, white color. This product was specifically studied to remove two proven metals known to cause allergy and suspicious to be carcinogenic respectively: Nickel and Cobalt. Both of these metals are presently used in the majority of palladium alloy systems available. The ultimate deposition of the palladium/iron layer provides a ductile, consistent 90/10 deposition ratio making the deposit naturally 10% less expensive than a pure palladium layer. The solution is absent of free ammonia making it easy to operate over time. Aside its decorative use, it also combines a protective layer against corrosion and copper migration.

- 90% Palladium and 10% iron electroplated alloy
- Hypoallergenic = Nickel and Cobalt Free
- 100% REACH compliant
- 3 Micron of thickness - without intermediate processing
- Superior Leveling Capabilities - 90/10 alloy throughout the surface
- No Free Ammonia = pH balance
- High resistance to metallic contamination such as copper

DEPOSIT DATA	
Purity (%)	90
Hardness (kg/mm^2)	450 - 500
Density(g/cm^3)	12
Thickness (µm)	0.2 – 3
Appearance	Shiny
Color	Light (White – Light Gray)

PRODUCT FORM	
Form	Concentrate Make up
Pd concentration	3.5 g/l (optimal)
Material Color	Green – yellow solution
Storage time	2 years for make-up
Volume	25 liters = 33 liters ready-to-use

OPERATING DATA	RANGE	OPTIMAL
Voltage (V)	1.0 – 2.5	According to current density
Current density (A/dm^2)	0.75 – 1.0	1.0
Working temperature (°C)	30 - 55	50
Exposure time	According to the final thickness to be obtained. Generally 1 µm is obtained in 4 mins when working at the optimal current density of 1A/dm^2	
Cathode efficiency (mg/Amin)	29	
pH	6.5 – 7.2	6.8 - 7.0
Solution density (Bè)	10-12	11
Anode type	Titanium-Platinized (Ti/Pt)	
Agitation	Suggested, moderate	

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METAL CONCENTRATION		
METAL	**RANGE (g/l)**	**OPTIMAL (g/l)**
Palladium (Pd)	2.0 – 5.0	3.5
Iron (Fe)	0.5 – 0.7	0.6

COLOR COORDINATES	
L	83.8
a	0.4
b	4.3
c	4.3

Note: The color coordinates shown here have been recorded on a white substrate and are intended as PURELY INDICATIVE being highly dependent on the color of the starting substrate, the deposited thickness as well as the type of surface (design) on which they are measured

PRODUCTS CODES COMPONENTS:

PRODUCTS REQUIRED FOR INSTALLATION	
PDFEB	Concentrated Make-up for Palladium Iron (25 L make-up = 33 L ready to use solution)
PDFEB-7	Concentrated Make-up for Palladium Iron (5.25 L make-up = 7 L ready to use solution)
PD100RW*	Palladium tetramine sulfate 39% salts (1 pack containing 100 g of fine palladium)
PD100RL*	*Concentrated Palladium tetramine dichloride solution 100 g Pd/liter (to be used alternatively to PD100RW salts)*

*Product which is subject to the international regulations concerning transportation of dangerous goods.

PRODUCTS FOR MAINTENANCE AND RECOVERY OF THE BATH	
PD100RW*	Palladium tetramine sulfate 39% salts (1 pack containing 100 g of fine palladium)
PD100RL*	*Concentrated Palladium tetramine dichloride solution 100 g Pd/liter (to be used alternatively to PD100RW salts)*
PDFER	Replenisher solution for Palladium Iron (5UN = 1L)
KFE	Iron complex solution (5 g/l) (5L)
PDFEBR1	Brightener 1 for Palladium Iron (1L)
PDFEBR2	Brightener 2 for Palladium Iron (1L)
PDFEM	Wetting agent for Palladium Iron (1L)
PDXWSC	Conducting salts for Palladium (5kg)
PDXWSS	Stabilizing salts for Palladium (5kg)

*Product which is subject to the international regulations concerning transportation of dangerous goods.

PREPARATION OF SOLUTION

PROCEDURE FOR READY-TO-USE PLATING SOLUTION PREPRATION (PAY ATTENTION! EVERY INDICATED QUANTITY PER LITER HAS TO BE INTENDED AS PER FIANL READY TO USE SOLUTION):

Before starting **PDSTARK-FE** solution preparation, make sure the working tank is perfectly cleaned. If not, the working tank should be cleaned with solution containing 2% of ammonia and 2% of KOH. The solution should be kept at 50 °C for two hours. Then, drain the tank and rinse with abundant deionized water until the output washing water will show a neutral pH.

At this point it will be finally possible to set the ready to use plating solution by following step-by-step this procedure:

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1. Fill the working tank with the make-up **PDFEB or PDFEB-7**. The quantity of make-up to add in liters is equal to ¾ of the total required final volume so that it will necessary to add 0.75 liters of make-up per every liter of ready-to-use solution to prepare.

2. Add then very slowly the Pd complex salt PD100RW. If we aim to realize a final concentration of 3.5 g/l ad fine Pd we will need to add around 9 g of PD100RW per every liter of ready to use plating solution to prepare. **Better to do the addition of Pd salts when the latter have been previously dissolved in HOT Deionized water (D.I. water) and then poured into the working tank as a concentrate solution.** Alternatively, if the liquid Pd complex PD100RL solution is used it as Pd source it will be necessary to add 35 ml (equal to 3.5 g of fine Pd) of it per every single liter of plating solution to prepare.

3. Raise finally the final volume by addition of D.I. water.

4. Heat the solution so prepared by setting the working temperature and once reached start to plate.

FINAL NOTE ABOUT THE READY-TO-USE SOLUTION PREPARATION: pay attention that the concentrated make-up can have a color towards brownish tones but by taking it to the ready to use final volume and by keeping it under stirring for a couple of minutes it will get a yellow light color. This color tuning will speed up further if the elctroplating solution will work for 30-60 minutes. Moreover it is here highlighted that any addition of Pd salts can generate a blackish suspension over the electroplating solution similar to thin powder: this will not absolutely compromise the right functionality and performances of the same solution and if it will happen it will be sufficient to change more frequently the filter cartridges inside the pumps in order to keep the electroplating solution more clean as it is possible.

BATH MAINTENENCE

For **PDSTARK-FE** baths the additions for maintenance of the plating solution should be done by using the right replenisher reported on the table at the previous page of this Technical Chart.
For optimum performance of the electrolytic solution, it is best to work with a Pd concentration that is within 20% less than the initial concentration: for example, with a bath at 4 g/l nominal value, additions must be done after a maximum consumption of 0,8 g/l of Palladium. In order to perform the additions, always consider that a 4 g/l bath deposits on average 25 - 30 mg of Palladium per Ampere/minute. As Palladium is a precious metal, and in order to control consumption, periodic analytic controls are advised. Remember also that the solution works with an optimum iron concentration of 0.6g/l within a range of 0.5 - 0.7 g/l.

Replenisher compounds usage.

Use **PD100RW** as palladium salts replenisher for the maintenance of this process (see related Pd salts technical chart) or **PD100RL** concentrate Pd solution as alternative to Pd salts.
All the other components consumed during electrodepositions and by drag-out phenomena are, on the contrary, restored by the addition of PDSTARK-FE complete replenisher units which are affordable requiring **PDFER** replenisher.

As general guideline keep in mind that every 4000Ampereminutes (clicks) are consumed about:

- 100 g of fine Palladium (to be restore by using 1 entire packaging of PD100RW salts or 1 liter bottle of PD100RL);
- 2 liters of **KFE** (Iron complex solution);
- 1 unit replenisher (equal to 200 ml) of **PDFER**.

Keep in mind that these values are indicative and they should suffer variations on the basis of the used plant, type of items to be plated or even according with the working methodology.

EQUIPMENT AND TOOLS

ANODES

It is strongly suggested the use of Titanium platinized (Ti/Pt) anodes with a layer of platinum of 2.5 µm.

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MATERIALS FOR THE WORKING TANK

PP/ PVC/ HDPE for larger volume tanks supplied together with a good quality exhaust fume/suction system or Pyrex glass (for small volume amount solutions in beaker scale).

MOVEMENT AND FILTRATION

Solution needs to be under movement and stirred by a suitable magnetic driven filter pump. When in movement, the solution needs also to be filtered by using 5 - 15 microns PP wrapped wire filter cartridges which stayed previously immersed in deionized water heated at 60°C for a couple of hours and then washed with abundant deionized cold water before their usage in order to avoid any possible organic contamination coming form the same filter cartridges material.

Filter pump must have a flow rate 5 times/hour more than solution volume to have a proper solution filtration and movement during the electrolytic process.

WATER PURITY

To prevent any bath contamination during the ready to use solution preparation or during any other subsequent maintenance operation, it is advisable to use deionized water with a conductivity less than 3 µS/cm (and free from any traces of organic compounds, silicon, boron).

RECTIFIER

Use a current DC rectifier having an alternate current residue –ripple-less than 5% and having an output amperage sufficient to obtain a proper electroplating process. The rectifier should be equipped with:

- Ammeter
- Voltmeter
- Ampere/minutes counter

HEATING SYSTEM

The admitted materials for heaters are: Pyrex, quartz or PTFE.

SUPPLEMENTARY INFORMATION

GENERAL NOTES ON THE PALLADIUM PLATING PROCESS

The items to be treated are prepared according to the usual method. In general you are recommended to start by washing in an ultrasounic bath, followed by rinsing and subsequent alkaline electrolytic degreasing at 4-6 Volts for 1 - 2 minutes *(in doing the pre-treatment degreasing step we recommend to use our NEATECH Line products).* Neutralize by immersion in a 5% sulfuric acid solution or similar (e.g. solution obtained by dilution of SATT activation salts), rinse in demineralized water and dip finally the pieces in the palladium plating bath at 50°C for the required time according with the thickness you wish to achieve, at an approximate voltage of 1.0 – 2.0 Volts, under moderate solution movement.
Although this is a micron treatment, high plating time is due to the reduced electrodeposition speed. Avoid the application of high voltages as they can cause burning on the pieces, which is visible even after successive plating treatments.

If the palladium plating treatment is applied as an intermediate layer on white gold items which are then rhodium-plated, it is important that the palladium and rhodium plating are performed in rapid succession. After the palladium plating treatment, the pieces are rinsed with demineralized water and neutralized in a 5% sulfuric acid solution or using the Legor NEUT1 solution or prepared by SATT dissolution.
After rinsing with demineralized water, the pieces must be immediately rhodium plated following the normal instructions. Avoid to perform electrolytic degreasing treatment on the palladium plating as it will cause blackening of the piece due to absorption of the hydrogen in the palladium. If you have accidentally done this, anodic degreasing treatment (inverted polarity) or heating of the pieces for a few minutes at 80°C should restore the original characteristics of the plating.

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pH CORRECTION

pH needs to be maintained inside optimum range values. Normally it tend to be decrease with respect to the optimal range 6.5 - 7.2 during time and if it is necessary to higher, the correction can be done by the slow addition of diluted ammonia solution until reaching again an optimal value; on the contrary if it is necessary to lower it add slowly a diluted sulfuric or acetic acid solution. In order to do this type of operation it is strongly suggested to keep constantly monitored the pH by the use of a pHmeter probe and if possible run this operation at room temperature.

PLATING SOLLUTION DENSITY

In case of strong drag out phenomena the solution density might be lower than its optimal condition.
If it is necessary to raise the solution density it has to be known that **1 °Bé** is restored by the addition of **20 g/l of PDXWSC + 10 g/l of PDXWSS.**

ABOUT BRIGHTENERS

If the deposit would come out les bright or less shine than normal it is possible that it is low in brighteners content.

This condition can happen mainly because of:

1) strong drag out phenomena;
2) natural degradation of organic compounds as the brighteners are;
3) after a treatment with active carbon.

In case it is possible to restore the normal brighteners content by adding **4 ml/l of PDFEBR1 + 2 ml/l of PDFEBR2** at a time.

Verify the effect of the brighteners addition by running a Hull Cell test at 0.5 A total for 1 minute and if necessary repeat the same addition until the initial bright level will be restored. **IN ANY CASE DO NOT ADD MORE THAN 4 ml/l of PDFEBR2** (that means do not add more than two subsequent addition of PDFEBR2).

PACKAGING

The make-up as well as all the other products of PDSTARK-FE process comes in a high-density polyethylene tank, bottles and bucket.

SAFETY INFORMATION

Classification and designation are noted in the Material Safety Data Sheets for each process product component (according to the European legislation). The safety instructions and the instructions for the environmental protection must be followed in order to avoid hazards for people and environment. Please consider the explicit details in our Material Safety Data Sheets.

DISCLAIMER

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