

RHODUNA® J1

Operating Instructions

Edition: 1 April 2005

Initial Concentrate with 2 g Rh/100 ml

- for decorative applications
- brilliant-white, very light coatings
- up to 0.3 µm coating thickness
- for rack and barrel plating

Bath Characteristics

The RHODUNA® J1 electrolyte is intended for the deposition of brilliant-white, very light, bright coatings. It is particularly suitable for the rhodium plating of jewellery, watches, spectacle frames and other articles of decorative refinement. The usual coating thicknesses for these applications are 0.1 - 0.3 µm.

Rhodium content: 2 g/l

pH value: < 1

Temperature: 20 - 40 °C

Current density: 1 A/dm²

Deposition speed: approx. 0.025 µm/min

Coating Characteristics

Coating: rhodium

Colour: brilliant-white

Hardness: 800 - 900 HV

Maximum coating thickness: 0.3 µm

Form of Supply

Bath makeup: a) RHODUNA® J1 Initial Concentrate
2 g Rh/100 ml, contains acid
100 ml for 1 l of bath
Storage stability: min. 2 years

Bath replenishment: b) RHODUNA® J1 Replenisher
Solution
5 g Rh/100 ml, contains acid
Storage stability: min. 2 years

Bath Makeup

Makeup sequence: For 1 l of RHODUNA® J1 bath 100 ml of RHODUNA® J1 Initial Concentrate containing 2 g Rh/100 ml are required. First thoroughly mix the Initial Concentrate by shaking. Minimal flocculations or precipitates must not be filtered off. They will dissolve during the makeup of the bath. Very slowly add (at room temperature) 100 ml of RHODUNA® J1 Initial Concentrate containing 2 g Rh/100 ml to 500 ml of deionized water, stirring constantly. Then fill up to 1 litre with deionized water. It is absolutely essential to keep to this order!

Operating Conditions

Rhodium content: 2 g/l (1.6 - 2.4 g/l)

H₂SO₄ concentration: rising with use of the bath (by replenishment)

Operating temperature: 20 - 40 °C, preferably 35 °C

pH value: < 1, no control required

Bath density: rising with use of the bath (by replenishment)

Product agitation: required
recommended speed 5 - 10 cm/s

Bath agitation: recommended, bath agitation by air agitation is not suitable

Important: Hydrogen bubbles adhering to the parts must be removed by tapping or occasional knocking on the rack. Otherwise stains on the parts may occur.

Current density: approx. 0.5 - 2 A/dm², preferably 1 A/dm²

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| Voltage: | 2 - 4 volts If the surface of the parts and thus the required current cannot be calculated, work with a bath voltage which is just sufficient for the minimal evolution of hydrogen bubbles (between approx. 2 and 2.5 volts). |
| Deposition rate: | approx. 3.2 mg/Amin at 35 °C and 1 A/dm ² |
| Current efficiency: | approx. 15 % at 35 °C and 1 A/dm ² |
| Deposition speed: | approx. 0.025 µm/min at a current density of 1 A/dm ² and 35 °C |
| Hint: | At room temperature deposition rate, efficiency and deposition speed will be reduced to approx. half of the stated values. |
| Barrel plating: | RHODUNA® J1 is also excellently suited for barrel plating. In order to reach a better throwing power, a higher current density than usual for rack plating should be chosen. Recommended standard values: Current density: app. 3 A/dm ² Voltage: 6 - 9 volts Temperature: 35 °C Deposition speed: app. 0.03 µm/min This value can only be a reference value because the deposition speed depends on type and agitation of the barrel and on shape and quantity of the parts. |
| Density of the coating: | approx. 12.4 g/cm ³ |
| Time of exposure: | at least 2 minutes (= 0.05 µm) |
| Lifetime: | The bath should be exchanged at the latest after 10 MTOs (deposition of 20 g Rh/l), because with an increasing sulphuric acid concentration (caused by replenishment) current efficiency and deposition speed will drop. |

Calculation of Coating Thickness and Plating Time

Coating weight in mg = surface in cm² x 1.2 x coating thickness in µm

Plating time in minutes = $\frac{\text{required coating weight in mg}}{3.2 \times \text{current in A}}$

(valid for 35 °C and 1 A/dm²)

Bath Replenishment

After depositing approx. 20 % of the rhodium content (0.4 g Rh/l), add per litre of bath 8 ml of RHODUNA® J1 Replenisher Solution containing 5 g Rh/100 ml. 0.4 g of Rh will be deposited after a current passage of approx. 125 ampere minutes at a current efficiency of 15 %. At 8 % efficiency (room temperature), approx. 235 ampere minutes are needed for the same deposition.

Bath Monitoring and Correction

Keep the bath clean. Cover when not in use and take the platinized titanium anodes out of the bath. Store in a closed bottle when not in use for a longer period of time. Filter turbid baths.

Always correct the **rhodium content** with RHODUNA® J1 Replenisher Solution (5 g Rh/100 ml).

Avoid any **metallic contaminants** (particularly silver and copper) and drag-in of cyanide!

With Electrolytes, which are heavily charged with **organic contaminants**, an active carbon treatment can be performed. It can be carried out without any significant loss of rhodium. Add 2 g/l of Active Carbon 1 into a separate tank, stir for 2 hours at operating temperature and then filter.

Analytical control: **Analytical control** of the concentration of rhodium and possibly of sulphuric acid.

The bath has to be exchanged at the latest after the sulphuric acid content has increased to 100 g/l.

Special Process Hints

Pre-treatment: Etch, grind, polish etc. the base metal to achieve the desired initial surface condition. Preliminary degreasing should be effected with e.g. an alkaline cleaning solution, or an ultrasonic bath. Rinse, then degrease electrolytically, rinse under running water, and finally with deionized water.

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| Pre-nickel plating | <p>Rhodium can be directly deposited on silver, gold, copper and copper alloys, nickel and nickel alloys. When plating tin, lead, zinc, cadmium, aluminium and iron, intermediate nickel coatings of some micrometres thickness are absolutely essential.</p> <p>When nickel plating is completed, rinse thoroughly. Each rinsing operation before rhodium plating should consist of rinsing under running water followed by rinsing with deionized water.</p> |
| Acid dip: | <p>After degreasing or pre-nickel plating, dip the workpieces in 1-3 vol.% sulphuric acid (chemically pure) at room temperature before hanging them into the rhodium bath to ensure that no alkalis are dragged into the rhodium bath.</p> <p>If particularly great difficulties are encountered in wetting after pre-nickel plating, repeat the electrolytic degreasing and acid dip treatments. The last step before rhodium plating should always be an acid dip treatment.</p> |
| Rhodium plating: | <p>After the acid dip, drain the workpieces quickly, connect to current and hang into the rhodium bath without intermediate rinsing. In order to prevent brownish stains, occasionally remove any hydrogen bubbles adhering to the parts by tapping either parts or rack.</p> |
| Flash plating: | <p>The plating of a flash at increased current density is advantageous in some cases, e.g. when rhodium plating onto silver and copper alloys, also especially onto hollow parts. For this purpose a flash plating with 3-4 times of the normal operating current density is applied for approximately one minute. (Avoidance of passive layers, fast covering also in undercuts and recessions. The evolving hydrogen must be allowed to escape without hindrance.</p> |
| Post-treatment: | <p>Allow the bath fluid to drain off thoroughly. Rinse in deionized water, then in running water and - if possible - also in hot water. Dry immediately. Use the first recovery rinse water for topping up the rhodium bath.</p> |

Equipment

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| Bath tanks: | plastic tank of polypropylene (possibly also glass, porcelain) |
| Accessories: | <p>All plastic parts coming into contact with the bath, e.g. bath tanks, rack insulations, barrels, pump and hoses, prior to use must be acidified in 5 - 10 % sulphuric acid for approx. 24 hours.</p> <p>Very important: If the bath is filtered, prior to use the filter candles must be boiled in 10 % sulphuric acid for approx. 3 hours. Then they are inserted into the pump and rinsed with water. It is essential to change the water several times.</p> |
| Heating: | immersion heaters coated with porcelain, quartz, or Teflon equipment for temperature control required |
| Product agitation: | required |
| Anodes: | <p>platinum or platinized titanium, e. g. PLATINODE® coated with 2.5 µm of platinum.</p> <p>surface ratio anodes : parts at least 1 : 1.</p> <p>Distance from parts to anodes at least 5 cm.</p> <p>if the anodes are suspended from wires or tapes, these also have to be made from either titanium or platinized titanium.</p> |
| Rectifier: | with sufficient capacity, with current display |
| Exhaust system: | required for large baths (strongly acidic bath mists entrained by evolution of hydrogen) |
| Recovery: | To recover the rhodium content, we will reprocess spent rhodium baths and the first rinse water, if this is not required to fill up the bath. |

Note

Our information relating to the storage stability refers to storage in closed original storage containers under the conditions stated on the label.

Precautionary Measures/Safety Hints

The bath contains strong acids in a high concentration. For information on safety, please see the corresponding Material Safety Data Sheets! The valid accident prevention regulations and safety information must be observed!

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