

**DESCRIPTION**

GFRED is a gold electrolyte intended for bath plating, which deposits a uniform, shiny layer in a red gold. The deposit can be described as a deep red color close to that of copper. GFRED is intended for decorative use therefore has been designed for flash plating permitting a deposition thickness of up to 0.2 micron. This red gold plating solution is Nickel, Lead, and Cadmium free.

- Red gold color
- For decorative layers up to 0.2 micron
- Good color repeatability
- Low gold content

**DEPOSIT DATA**

Purity (%)	99.9
Hardness [HV 0.01]	160 - 220
Density [g/cm <sup>3</sup> ]	19.0
Thickness from-to [µm]	0.02 - 0.20
Aspect	Shiny
Color	Red

**PRODUCT FORM**

Metal concentration	0.8 g Au/l
Product pH	Alkaline
Format	Ready to use liquid
Color of the product	Colorless
Storage time	2 years
Volume	1 L

**PRODUCT USAGE**

	<b>RANGE</b>	<b>OPTIMAL</b>
Voltage [V]	3.5 - 5.5	4.5
Current density [A/dm <sup>2</sup> ]	0.5 - 2.0	1.2
Working temperature [°C]	55 - 65	60
Treatment time [sec]	10 - 60	35
Cathodic efficiency [mg/Amin]	8 - 12	10
pH	9 - 11	10
Solution density [°Bé]	3 - 6	4 - 5
Anode/cathode ratio	> 1:1	
Anode type	Ti/Pt or Stainless steel	
Stirring	Moderata	

**METAL CONCENTRATION**

METAL	RANGE	OPTIMAL
Au	0.4 - 0.8	0.8 g Au/l

**COLOR COORDINATES**

L *	85.4
a*	10.4
b*	17.0
c*	18.2

**Note:** Color coordinates here reported have been measured on a white underlayer and they are to be intended as PURELYINDICATIVE being strongly dependent on underlayer color , on thickness of the deposit and on specific design(shape)of the surface.

**RELATED PRODUCTS - MAINTAINING**

AUS683.100G*	Replenisher salt for gold plating 68.3 g Au/100 g
GF10AUR.100ML*	Gold replenisher for GF gold plating series 10 g/100 ml
GF1CUR.1G	Copper replenisher for GF gold plating series - 1 g Cu
FLASHGOLD-SC.1KG	Conducting salts for gold flash - 1 kg
FLASHGOLD-SC.5KG	Conducting salts for gold flash - 5 kg
GFM.1L	Gold flash wetting agent -1 L

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

**USER GUIDE****READY TO USE SOLUTION PREPARATION**

GFRED is a ready-to-use plating solution at the concentration of 0.8 g/l of gold. No preparation is required. Pour it directly into working tank, heat it up to the preset temperature and once reached start to plate.

**ANODES**

Use Titanium Platinized anodes with a layer in platinum not lower than 1.5 µm. Alternatively, it also possible to use Stainless steel AISI 304 or 316 anodes.

**WORKING TANK MATERIALS**

For small volume amount solutions - in beaker scale - use Pyrex glass; vice versa use PP /PVC/HDPE tanks for larger volumes and equipped with an efficient exhaust fume/suction or aspiration system (the gold plating solution might develop potentially toxic or harmful fumes that can also be irritant if inhaled or with allergenic effects).

**DC POWER - RECTIFIER**

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

- Amperemeter
- Voltmeter
- Ampere/minutes counter (for bigger installations only).

**HEATING SYSTEM**

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

**FILTRATION AND MOVEMENT**

For bigger plating installations (> 5 liters) it is advisable to keep the plating solution continuously filtered and in movement through a magnetic driven filter pump with 5-15 µm cartridges in PP that must have been previously conditioned by boiling them for at least 3 hours and then washed with DI water in order to prevent any possible organic contamination.

**PLATING SOLUTION MAINTENANCE**

As general guideline considers to add 10 g of fine gold every 1000 Amin while silver and copper needs to be added according with chemical analysis. In general, we can say that this process is easy to maintain, but will initially requires frequent analytical controls in order to obtain a correct concentration level of all the metals present. In fact metal concentrations strongly influence the final deposited color; therefore, an incorrect management of these parameters shall inevitably lead to unwanted colors. Some general guidelines for maintenance are below described:

- Adding GF1AGR will lead the color towards green-/pale hues.
- Adding GF1CUR will lead the color towards red/pink hues.
- Adding AUS683 salts or GF10AUR solution will restore the gold content more than take the color towards yellow hues.
- Potassium cyanide concentration must be frequently controlled to be maintained at the correct working concentration (0.6 -1.2 g/l).

**PRETREATMENTS**

This gold plating solution for flash application can be directly deposited directly on Gold, Silver, Palladium, other precious metal substrates and Nickel. For other metals (i.e. Copper and its alloys or Silver) it is necessary to make an intermediate deposit of Palladium or Nickel to prevent copper migration. An intermediate deposit or precious metal plating strike is necessary before depositing onto Tin, Lead, Zinc, Aluminum, and Iron-based materials in general. As pre-treatment it is suggested to run a preliminary degreasing through a cycle of ultrasonic degreasing treatment -solution followed by a wash step into running water. Then proceed with the electrolytic degreasing step by using the alkaline degreasing solution SGR1. Once the items has been washed again in demineralized water, then proceed in activate and neutralize the surface of the same by dipping them into the slightly acidic solution NEUT1 for 3–4 times subsequently at room temperature, in order to be sure that no any alkaline residues coming from the degreasing previous steps are dragged into the solution together with the same items to be treated (which would lead to a reduction of its life). After the neutralization, wash in demineralized running water and immerse the pieces in the gold plating solution for the plating treatment.

**POST TREATMENTS**

The electrolyte should be removed from the surface as quick as possible. Wash off the plating solution residues in a recovery rinse (static rinse). Rinse the parts in circulating deionized water and dry. A possible last rinse in hot static water before dry can help in gain more brightness and luminosity.

**WATER PURITY**

To prevent contamination of the plating solution during any replenishing operations, use demineralized water with a conductivity of less than 3  $\mu\text{S}/\text{cm}$  (containing no traces of organic compounds, Chlorine, Silicon, or Boron). To achieve maximum deposit quality we suggest to use our high-grade purity WATER.

**ITEMS AND PLATING SOLUTION MOVEMENT**

For maximum performance, especially in terms of color, do not use excessive agitation. For bigger tanks it is advisable the use of a magnetic driven pump with a not too much high feed; while for lower volumes it will be sufficient just the moderate agitation for items to be gilded.

**ABOUT pH**

pH needs to be maintained within optimum values. If it will be necessary to raise it add slowly concentrate potassium hydroxide solution (20-30%) vice versa add 20-30% of a phosphoric acid solution to lower, it (the latter possibility happens rather seldom).

**ABOUT SOLUTION DENSITY**

The plating solution density must stay inside an optimum range. Addition of 10-12 g/l of FLASHGOLD-SC conducting salts raises of +1°Bé the density of the gold flash solution.

**SAFETY INFORMATION**

AVOID ANY DRAG IN OF ACIDS IN GOLD PLATING SOLUTION TO AVOID THE DEVELOPMENT OF HIGHLY TOXIC FUMES! Being an alkaline solution, the electrolyte is an irritant to the skin, eyes and mucous membranes. Caution should be exercised when using the product, avoiding contact with the eyes and skin. Use gloves and safety goggles. Keep away from acid based chemicals. For further information please refer to the relative MSDS.

**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 Legor Group, its subsidiaries or 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.