

# UNITED STATES PATENT OFFICE

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## ELECTRODEPOSITION OF METALS OF THE PLATINUM GROUP

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9 Claims. (Cl. 204—1)

This invention relates to the electrodeposition of the metals of the platinum group, viz. platinum, palladium and/or rhodium and alloys of these metals with one another in any desired proportions, from aqueous solutions and to the preparation of suitable baths for this purpose.

It has already been proposed to use baths comprising a solution of an ammimo nitrite of these metals in dilute ammonia containing a conducting salt, but these baths usually produce more or less gassing at the cathode which results in the production of porous deposits.

We have now found that platinum or palladium or rhodium, or any or all of these metals in combination can be plated electrolytically on to the precious metals and most of the common base metals from baths comprising a solution of a double sodium nitrite of the platinum group metal or metals desired, which solution is preferably used in a neutral or slightly acid condition. These double nitrites are prepared by boiling neutral solutions of the sodium platinum chloride with an excess of sodium nitrite and may be obtained in a solid form by evaporation and crystallization. We prefer to use as the electrolyte a solution containing from 1 to 1.5 per cent of the platinum group metal or metals in the form of the double sodium nitrite. As an acidifying agent we may use sulphuric, phosphoric or other mineral acid the anion of which is neither oxidized at the anode nor reduced at the cathode during plating, for example very satisfactory results have been obtained by the addition of up to 5 per cent of phosphoric acid.

Instead of sodium nitrite we may use any other nitrite which forms a stable soluble double nitrite with the platinum group metals and the metal of which is not deposited with the platinum group metal during the plating operation.

By using solutions containing double nitrites of more than one of the platinum metals it is possible to deposit alloys of these metals for example, with a mixture of sodium platinonitrite and sodium rhodonitrite an alloy of platinum and rhodium may be obtained, in which the relative proportion of platinum and rhodium is approximately the same as that of the metals in the solution. By suitable adjustment of the relative proportions of the metals present in the bath it is possible to obtain alloys of varying degrees of hardness and having colours varying from steel-grey to almost silver-white.

The throwing power of these baths is considerably improved by the addition of a conducting

salt, such as sodium sulphate. Regeneration may be carried out by the addition of a further quantity of the plating salt or salts.

Whilst the efficiency of this bath does not reach 100 per cent, there is no evolution of hydrogen at the cathode, as any hydrogen ion discharged simply reduces the nitrite radicle to ammonia. In view of this it is necessary to add from time to time small quantities of phosphoric or other acid, as hereinbefore mentioned, in order to keep the bath acid and thus maintain a constant current efficiency.

Brighter, denser and more adherent deposits are obtained if the bath is operated at a temperature above 40° centigrade, preferably at from 65° to 80° centigrade.

What we claim is:—

1. Process for the electro-deposition of metals of the group platinum, palladium and rhodium in which the plating bath comprises a solution of a soluble double sodium nitrite of the metal rendered slightly acid by the addition of a small quantity of a mineral acid the anion of which is neither oxidized at the anode nor reduced at the cathode during plating.

2. Process for the electro-deposition of alloys of metals of the group platinum, palladium and rhodium in which the plating bath comprises a solution of the double sodium nitrites of the metals in the such proportions that the ratio of the metals in the solution is the same as that of the alloy it is desired to deposit by plating rendered slightly acid by the addition of a small quantity of a mineral acid which is neither oxidized at the anode nor reduced at the cathode during plating.

3. Process according to claim 1 in which the plating bath comprises a solution of a salt of the group sodium platinonitrite, sodium palladonitrite and sodium rhodonitrite rendered slightly acid by the addition of a small quantity of a mineral acid which is neither oxidized at the anode nor reduced at the cathode during plating.

4. Process according to claim 2 in which the plating bath comprises a solution of salts of the group sodium platinonitrite, sodium palladonitrite and sodium rhodonitrite rendered slightly acid by the addition of a small quantity of a mineral acid which is neither oxidized at the anode nor reduced at the cathode during plating.

5. Process for the electro-deposition of metals of the group platinum, palladium and rhodium in which the plating bath comprises a solution of a soluble double sodium nitrite of the metal

rendered slightly acid by the addition of phosphoric acid.

6. Process for the electro-deposition of alloys of metals of the group platinum, palladium and rhodium in which the plating bath comprises a solution of the double sodium nitrites of the metals in the desired proportions rendered slightly acid by the addition of phosphoric acid.
7. Process according to claim 1 in which the plating bath comprises a solution of a salt of the group sodium platinonitrite, sodium palladonitrite and sodium rhodonitrite rendered slightly acid by the addition of phosphoric acid.

8. Process according to claim 2 in which the plating bath comprises a solution of salts of the group sodium platinonitrite, sodium palladonitrite and sodium rhodonitrite rendered slightly acid by the addition of phosphoric acid.

9. The method of electrodepositing rhodium which comprises passing an electric current through an electrolyte containing a mineral acid the anion of which is neither oxidized at the anode nor reduced at the cathode during plating and a soluble sodium rhodium nitrite compound.

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