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ELECTRODEPOSITION OF NICKEL ON URANIUM

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This invention relates to the preparation of metallic surfaces for the application of coatings. It is particularly concerned with the preparation of metals above iron in the electromotive series for the application of adherent electro-deposits.

The preparation of metals high in the electromotive series for coating is rendered difficult by the strong tendency of such metals to form compounds with any reagent with which the metals are contacted. Thus they react readily with the oxygen in air to form metal oxide films which coat the metal surface and prevent adherence of electrodeposits to the metal. Similar films are formed by contact of the metals with aqueous solutions.

It is an object of the present invention to prepare such metals so that coatings subsequently applied can adhere firmly to the metal surface. A further object of the invention is the treatment of such metals to provide protection for the surfaces so that they will not be attacked by aqueous electroplating solutions. Still further objects will be evident in the light of the following description of the invention.

In accordance with my invention a metal above iron in the electromotive series is treated with a molten hydrate of ferric chloride, particularly $FeCl_3.6H_2O$ at a temperature above 37° C. (its melting point). This treatment etches the metal surface, providing a structure most suitable for the application of adherent electro-deposits and at the same time plates the surface electromotively with metallic iron. The metallic iron adheres firmly to the base metal, and though an extremely thin film, retards the action of aqueous electroplating solutions and avoids the formation of interfering non-metallic films on the metal surface before the coating metal to be electroplated begins to deposit.

The process of the invention is applicable to metals above iron in the electromotive series, such as uranium, aluminum, magnesium, and zinc.

Preferably the preparatory treatment is effected with molten $FeCl_3.6H_2O$ at a temperature between 50° C. and 70° C. for between about 1 minute and about 3 minutes. In treating large batches of metal an initial bath temperature of about 70° C. can be used to advantage to warm the metal to the treatment temperature while the bath temperature is allowed to fall to 50–60° C.

Before the metal is subjected to the etchant treatment with ferric chloride, it may be cleaned to remove foreign matter and metal oxides. Such cleaning may comprise washing with a grease solvent or with a detergent solution, sand-blasting, scrubbing with pumice, or dissolving oxide film with a reagent such as concentrated nitric acid.

After the etchant treatment it is desirable to electroplate the metal surface promptly while it still retains the character of a freshly prepared electromotive coating. The metal thus may be plated in conventional electroplating solutions such as acidic nickel, iron, and chromium, and acidic or basic copper and zinc electroplating baths.

The following examples illustrate the invention:

Example 1

A metallic uranium rod is dipped for about 30 seconds in aqueous 50% (by weight) HNO_3 solution at about 20° C. The article is then rinsed in water, dried, and dipped in molten ferric chloride hexahydrate ($FeCl_3.6H_2O$) maintained at about 50° C. until the rod is coated with an adherent black film of metallic iron. This requires about 30 seconds. The rod is then thoroughly rinsed in water and immersed in a nickel electroplating bath containing, per liter of solution, 240 grams of $NiSO_4.7H_2O$, 45 grams of $NiCl_2.6H_2O$ and 30 grams of H_3BO_3. With the rod as cathode a current is passed through the solution at a cathodic current density of 25 amperes per square foot. In fifteen minutes the rod is plated with a firmly adherent nickel electroplating about 0.0003 inch thick.

Example 2

A small aluminum strip is dipped in molten ferric chloride hexahydrate ($FeCl_3.6H_2O$) at 50° C. until it is coated with a black adherent film of metallic iron (about 1 minute). The coated metal is washed with water and electroplated as in the preceding example. An unusually adherent nickel electroplating is thus formed on the aluminum surface.

It will be understood that I intend to include variations and modifications of the invention and that the preceding examples are illustrations only and in no wise to be construed as limitations upon the invention, the scope of which is defined in the appended claims, wherein I claim:

1. A process for preparing metallic uranium for the application of an adherent electro-deposit upon its surface which comprises treating said surface with molten ferric chloride hexahydrate.

2. A process as defined in claim 1 wherein the treatment is carried out at a temperature between 50° C. and 70° C.

3. In the application of a nickel electroplating to metallic uranium, the improvement which comprises treating the surface of the uranium with molten ferric chloride hexahydrate between 50° C. and 70° C. until a black film covers the metal surface, washing the surface with water and promptly electroplating it in an aqueous nickel sulfate electroplating bath.

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