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ELECTRODEPOSITION OF CHROMIUM

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My invention refers to the electrolytic deposition of metals and more especially chromium. Its particular object is to improve the process of electro-deposition of chromium hitherto in use.

In this process the free acids, more especially strong mineral acids present in the electrolyte create considerable difficulties inasmuch as the presence of great quantities of such acids renders high current densities necessary for the deposition of chromium, and under certain conditions will even altogether prevent such depositions. The mineral acids, and more especially sulfuric and hydrochloric acid, can be present in the electrolyte from two causes, viz: as impurities of the commercial chemicals used (chromic acid for instance containing sulfuric acid) or as the products of decomposition of sulfates, chlorides, or the like during the electrolytic process. On the other hand small quantities of free acid exert a favorable action on the electro-deposition of the metal, for instance by keeping oxides dissolved.

According to the present invention now I add to the electrolytic bath, which consists of a watery solution of chromic acid which may also contain an addition of chromic sulfate, a salt or salts of chromium or of an alkali metal, the anions of which belong to weak acids having a coefficient of dissociation at least as low as that of phosphoric acid. The weak anion in this salt is thus replaced by the strong acids, for instance as follows:

Chromium acetate + sulfuric acid → chromium sulfate + acetic acid.

Sodium oxalate + sulfuric acid → sodium sulfate + oxalic acid.

While during these reactions as shown above, the concentration of the free acid is not changed, the exchange of anions causes the concentration of hydrogen ions to be lowered down to a favorable value without the necessary acid reaction of the baths disappearing. The additions above described have a certain buffer action on the electrolytic bath as a whole, inasmuch as they remain constantly effective during the electrolytical process and maintain constant the suitable concentration of hydrogen ions. By neutralization with alkali such effect cannot be obtained, as in this case the bath would have to be constantly watched and its composition adjusted during the operation.

By making the additions above described I provide that the deposition of chromium takes place also at low current densities, down to 1 ampère per square decimetre. In this manner I succeed in obtaining from such bath high-grade chromium deposits which are distinguished by their brilliancy, homogeneity, and perfect adhering capacity, all these properties being obtainable only when operating at low current densities.

Example.—To a watery chromic acid solution containing 300 grams chromic acid per liter were added 5 grams chromium phosphate. The anodes used with this electrolyte were lead anodes spaced apart 15 cms. The electrolytical process was carried through at a temperature of the bath of 20° C., at a pressure of 3.5 volts and a current density of 1 ampère per square decimetre or above. With a bath having the above composition a perfect chromium deposit having the properties above described was obtained within 1½ to 2 hours.

Various changes may be made in the details disclosed in the foregoing specification without departing from the invention or sacrificing the advantages thereof.

I claim:—

The process of electro-depositing chromium, which consists in adding to a solution of chromic acid containing a free, highly dissociated acid a salt of an acid with a dissociation constant less than the dissociation constant of phosphoric acid with relation to the first hydrogen ion liberated therefrom, to decrease the concentration of the hydrogen ions.

In testimony whereof I affix my signature.

RUDOLF AUERBACH.