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ELECTROPLATING.

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To all whom it may concern:

Be it known that I, CHAD H. HUMPHRIES, a citizen of the United States, residing at Kokomo, in the county of Howard and State of Indiana, have invented certain new and useful Improvements in Electroplating, of which the following is a specification.

This invention relates to electroplating and more particularly to the use of certain addition or brightening agents in the cyanide baths of various metals such as cadmium, copper, silver, zinc and brass used for electroplating with these metals.

I have found that protein substances when added to cyanide electroplating baths of metals give bright, dense, smooth, adherent and continuous deposits. In my application Serial No. 540,566, filed March 2, 1922, I have disclosed the use of two protein substances, to wit, wool and casein, in the electroplating of cadmium from a cyanide bath. I have now found that not only wool and casein but protein substances in general, for instance egg albumen, gluten, etc., may be employed advantageously not only in the electroplating of cadmium, but also in electroplating with other metals such as copper, zinc, silver and brass from cyanide solutions.

Wool consists essentially of keratin and belongs to the albuminoid family of the proteins, and casein is a conjugated protein belonging to the phospho-protein family. Both belong to the sulpho-phospho group of proteins. They are readily soluble in alkaline cyanide solutions, particularly when such solutions contain some free sodium hydroxide and function as brightening agents in a very satisfactory manner giving deposits sharply different from those obtainable from the simple cyanide solutions not only in continuity and hardness, but also in appearance. Under certain conditions it has been possible to obtain cadmium deposits so hard that when a piece of steel carrying the coating was flexed spangles of the coating flew off.

According to the theory of action of addition agents given in "Applied Colloid Chemistry" by Bancroft, 1921, pages 165 and 231, some of the addition agent must be adsorbed by the precipitating metal. This of course indicates a loss of the addition agent from the plating bath which must be made up by further additions thereto. If such adsorption does take place, it is very small or almost negligible, as I have found that extremely small quantities of the protein addition agents serve for a long period of time. Instances are known in which commercial plating baths have been used for over a year without any replenishing of the addition agent.

As stated, the quantity of the addition agent required is very small. As little as ½ gram of wool or ¼ gram of casein per gallon of electrolyte has been found to give satisfactory results. The quantity of addition agent preferably used ordinarily is greater than the minimum stated, however, and may vary under different circumstances from say ½ to 10 grams of wool, or ¼ to 2½ grams of casein.

The following examples illustrate the invention:

(1) To each gallon of a sodium cadmium cyanide solution containing from ¼ to 6 ounces of metallic cadmium and 2½ to 6 ounces of free sodium cyanide per gallon there is added preferably about 1½ grams of wool dissolved in a warm concentrated solution of caustic soda.

(2) To each gallon of a bath containing ¼ to 6 ounces of metallic cadmium and 2½ to 6 ounces of sodium cyanide per gallon there is added preferably about 1½ grams of casein dissolved in a warm dilute aqueous solution of ammonia.

Examples might be multiplied in great number using different metals, different bath compositions and different addition agents, but the foregoing sufficiently illustrate the invention.

This application is a continuation in part of my application Serial No. 540,566, filed March 2, 1922, referred to above.

I claim:

1. Method of obtaining bright, dense, coherent deposits of a metal upon another metal which comprises electrodepositing said first named metal from a cyanide solution thereof in the presence of a protein addition agent.

2. Method of obtaining bright, dense, coherent deposits of cadmium upon another metal which comprises electrodepositing cadmium from a cyanide solution thereof in the presence of a protein addition agent.

3. Method of obtaining bright, dense, coherent deposits of a metal upon another

metal which comprises electrodepositing said first named metal from a cyanide solution thereof to which has been added an alkaline solution of a protein as a brightening agent.

4. Method as defined in claim 3 in which the brightening agent is an ammoniacal solution of casein.

5. Method as defined in claim 3 in which the metal to be deposited is cadmium and the brightening agent is an ammonical solution of casein.

6. Method as defined in claim 3 in which the brightening agent is a protein of the sulpho-phospho group.

In testimony whereof, I affix my signature.

CHAD H. HUMPHRIES.