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BRIGHT DIP

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10 Claims. (Cl. 148—8)

This invention relates to the passivation and brightening of cadmium, and is particularly directed to processes for the passivation and brightening of electrodeposited cadmium with acidified solutions of oxidizing agents. This invention is, moreover, directed to the solutions used in such processes.

The cadmium plating processes now in use frequently produce plated articles which are stained and are not of a uniformly bright finish. With articles of very irregular shape some areas may be somewhat dull so that the piece does not have as uniformly a bright and lustrous finish as is desirable. Electrodeposited cadmium, moreover, displays the very disadvantageous property of staining easily, especially when touched by the fingers. This renders a plated article very difficult to handle without seriously damaging its appearance.

It has previously been proposed to treat cadmium plate with dilute oxidizing acids, but this proposed treatment has the disadvantage that a very considerable portion of the cadmium is dissolved. An oxidizing acid, even at the minimum effective concentration, may thus seriously damage the finish. Certain oxidizing acids also are unsatisfactory as they cause the formation of a colored film which is removable with great difficulty. Another disadvantage of oxidizing acid bright dips appears in the treatment of cadmium plated iron or steel over which nickel is to be plated. When certain oxidizing acids are employed as bright dips a subsequently applied nickel plate will not adhere properly.

I have found that the use of acidified solutions of oxidizing agents, and particularly acidified hydrogen peroxide solutions, as bright dips overcome the disadvantages encountered with prior art bright dips. Unlike solutions of oxidizing acids, my bright dips do not dissolve a cadmium plate to such an extent as to damage the finish, and they do not stain or discolor the work. Cadmium plate bright dipped by my processes may be nickel plated quite successfully, the nickel adhering in a very satisfactory manner.

An outstanding advantage gained through the use of acidified solutions of oxidizing agents is that cadmium plate treated therewith becomes passive. By reason of this passivity the plate is no longer sensitive to staining and may be handled freely.

Acids alone, in the small concentrations used, do not display a satisfactory brightening action, though they may remove a slight amount of stain. Oxidizing agents alone, similarly, are not satisfactory brighteners. Apparently, there is some synergetic action between the acid and oxidizing agent which causes the mixture to exercise an unexpected passivating and brightening action.

The oxidizing agent may be acidified with any desired material of acid reaction. I prefer to use sulfuric acid, both because it is cheaper and because it leads to superior results. I may, however, use inorganic acids such as hydrochloric, phosphoric, carbonic, etc., or organic acids such as lactic, acetic, citric, etc. Very weak acids such as carbonic and hypochlorous are none too satisfactory, for, while they operate as do stronger acids, they are effective to a much smaller degree. Some acids, such as hydriodic acid, are not economical, when used with hydrogen peroxide, for the reason that they cause rather rapid decomposition of the peroxide and so shorten the life of the bright dip. While I may use any acid, organic or inorganic, I prefer to use acetic acid or a mineral acid such as hydrochloric or sulfuric.

Instead of using acids, I may acidify a solution of an oxidizing agent with an acidulous organic or inorganic salt. As examples of such acidulous salts I may mention ferric chloride, cupric sulfate, potassium per sulfate, cupric chloride, sodium bisulfate, potassium acid phthalate, etc. While any acidulous salt may be employed, certain ones, such as iron or copper salts are none too satisfactory when used with hydrogen peroxide, because they accelerate its decomposition.

The amount of acidulous material used with an oxidizing agent is of the greatest importance. If the ratio of hydrogen peroxide, for instance, to the acidulous material be too small, the action of the dip will be typical of a direct acid etch. One must be careful, then, to use less acidulous material than will cause an etching of the cadmium plate being bright dipped. When sulfuric acid and hydrogen peroxide are used, for instance, the ratio of H_2O_2 (by weight) to H_2SO_4 (by weight) should not be less than about one to one. If a ratio substantially below one to one is used the dip will exercise a deleterious etching action on a cadmium plate. The other acidulous materials are used in corresponding amounts. The concentration of acidulous material and oxidizing agent may be varied at will. If a dilute solution be used, a longer time will be required to accomplish the desired passivating and brightening action than if a more concentrated solution be used. It is noted that for the best results

a higher ratio of oxidizing agent to acidulous material should be used in dilute solutions than in more concentrated ones. In general, I may state that the ratio of oxidizing agent to acidic material is such that at a suitable dilution no deleterious etching action occurs during the exposure required to brighten a cadmium plate.

The following example illustrates a preferred process and bright dip of my invention:

Example.—A U-shaped article, cadmium plated in known manner, was selected for test purposes. This form, like objects of irregular shape generally, tends to be dull in the recessed portions. After the article was plated it was rinsed in water and then dipped for about 15 seconds into a bright dip comprising 6 ounces of 100 volume H_2O_2 solution, one ounce of concentrated H_2SO_4, and a gallon of water. On removal from the bright dip the article was carefully washed and dried. The resulting article was passive to staining and had a lustrous, uniformly bright finish, the recessed portions being uniform in appearance with the rest of the article. It is noted that the ratio of H_2O_2 (by weight) to H_2SO_4 (by weight) was about 1.6 to 1.

My bright dip has about as long a life as other commercial bright dips, but care must be exercised lest some agent or condition be encountered which will accelerate decomposition.

I prefer to use relatively pure acids, as impurities such as are commonly found in commercial acids may cause decomposition of the bright dip.

The solution is preferably shipped and used in glass, glazed stoneware, hard rubber, or stainless steel receptacles. If lead, Monel metal, fiber, and similar materials are used to contain my peroxide bright dip a more rapid decomposition occurs.

I may, if desired, add a small amount of a known stabilizer for peroxide. The nature and use of stabilizers is well known to the trade and need not be described in detail. I have found small amounts of alcohol, sodium pyrophosphate and sodium stannate, glycerine, etc., quite satisfactory.

The peroxide bright dip may be sold in the form of a relatively concentrated solution of peroxide and acidulous material and a buyer can dilute the product to the desired extent. Of course, it can be sold as a relatively dilute solution or it can be made up at the place of use.

While the above example mentions only hydrogen peroxide as an oxidizing agent, it is obvious that other per-oxygen compounds may be employed. In general, I may use any oxidizing agent and I do not intend to be limited to the use of hydrogen peroxide.

While I have shown numerous specific conditions and limitations I do not intend to be restricted thereby, the scope of my invention appearing from the following claims.

This application is a continuation of my copending application Ser. No. 734,703, filed July 11, 1934.

I claim:

1. A composition for passivating and brightening cadmium comprising hydrogen peroxide and sulfuric acid, the ratio of peroxide to acid being about one and six tenths to one.

2. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide and a substance of acid reaction.

3. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide and an acidic material selected from the group consisting of mineral acids and acidulous mineral acid salts.

4. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide and sulfuric acid.

5. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide and sulfuric acid, the ratio of the peroxide to acid being no less than about one to one.

6. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide, and an organic acid.

7. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide and acetic acid.

8. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide and a mineral acid.

9. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide and hydrochloric acid.

10. In a process for the passivation and brightening of cadmium the step comprising subjecting the cadmium to the action of a bright dip comprising hydrogen peroxide and sulfuric acid, the ratio of peroxide to acid being about 1.6 to 1.

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