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TESTING MATERIAL

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7 Claims. (Cl. 23—230)

The present invention relates to the detection of a chromate conversion coating on a metal.

Since the inception of chromate conversion coatings on metals, and particularly where clear protective coatings of this type are applied, there has been a very definite need for a quick, easy, non-destructive method for determining the presence of these coatings and their relative protective value with reproducible results. Visual inspection is a very poor criterion for determining the presence of clear coatings or the protective value of colored coatings. Salt spray testing is the only standardized method used at the present time and leaves a great deal to be desired, due to the length of the test, lack of reproducibility of results, particularly from one piece of equipment to another and the fact that it is a destructive test.

Accordingly, it is a primary object of the present invention to devise an improved method and composition for detecting chromate conversion coatings on metals rapidly and in which the effect on the protective coating is negligible. Moreover, the present invention can be applied at various places on the same coated sheet or article, or on similarly coated other sheets or articles with reproducibility of results.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

It has now been found that these objects can be accomplished by simply applying a drop of the test solution of the present invention on the surface to be tested. The lack of or presence of a protective film will be indicated by the length of time taken for the amber test soultion to turn a blue-green color. The preferred procedure consists of testing side-by-side a cleaned but untreated metal surface of the same metal which has been treated. The untreated surface will react with the amber spot test solution and immediately change the spot test solution to a blue-green color. The presence of and protective value of the treated surface is indicated by the extended length of time taken for the spot test solution to penetrate the protective film and react with the underlying metal. The drop of spot test solution can then be removed by washing the surface in water or absorbing the spot test solution with a sponge or cloth. Examples of spot test solutions are as follows:

Example I

	Grams/liter of water
Ferric chloride	2
Potassium ferricyanide	2

This mixture is made by dissolving the ferric chloride and the potassium ferricyanide in water.

The formulation is applicable where the object of the test is to determine the presence of a protective chromate conversion coating.

The reaction rate of the solution to the metal can be increased by the addition of supplementary acid to the solution, as shown in Example II below.

Example II

	Grams/liter of water
Ferric chloride	1
Potassium ferricyanide	1
Hydrochloric acid	15

Solution pH 0.8.

The ferric chloride and potassium ferricyanide were added to a liter of water containing 15 grams of hydrochloric acid.

Example III

Ferric chloride	1 g./l. of water.
Potassium ferricyanide	1 g./l. of water.
Hydrochloric acid	15 ml. of 38% concentration of water.

Solution pH 0.8.

The ferric chloride and potassium ferricyanide were added to a liter of water containing 15 ml. of 38% concentration of hydrochloric acid.

The hydrochloric acid may have preferably a concentration of about 36.5% to 38%.

In place of ferric chloride, there can be employed any other water-soluble ferric salt, such as ferric nitrate, ferric sulfate, ferric bromide, etc. Similarly, in place of potassium ferricyanide, there can be employed any other water-soluble ferricyanide, such as the other alkali metal ferricyanides, e.g., sodium ferricyanide, ammonium ferricyanide, etc.

The pH of the aqueous solution is preferably adjusted to a pH of 0.1 to 3.0. Any strong acid, preferably a mineral acid, can be used for this purpose, such as hydrochloric acid, hydrobromic acid, sulfuric acid, nitric acid, etc. The range of ferric salt is preferably 0.1 to 10 grams per liter. The range of ferricyanide compound is preferably 0.1 to 10 grams per liter.

The test solution can be applied to any metal or alloy of metals, having a chromate conversion coating. Thus, it can be applied to aluminum, cadmium, zinc, copper, brass, silver, etc., having a chromate conversion coating.

Such chromate conversion coatings are prepared by methods well known in the art. In general, they are prepared by applying a solution of hexavalent chromium, e.g., chromic acid plus an active anion to the surface of the metal. Typical of methods of preparing such coatings are the methods described in Ostrander Patent No. 2,628,925.

Example IV

Zinc was coated with the chromic acid solution of Example I of Ostrander Patent No. 2,628,925, to obtain a bright, colorless, protective coating, as described in the patent. A drop of the acidic ferric chloride-potassium ferricyanide solution of Example II of the present application was applied to the chromate coated zinc as a small spot and allowed to remain in contact with the coated surface for 60 seconds. No color change was noted. When the spot test was repeated, but using untreated zinc, a green-blue color developed in 15 seconds.

Similar results were obtained with aluminum. That is, with chromate coated aluminum, no color change was noted after 60 seconds treatment with the solution of Example II while, when uncoated aluminum was em-

ployed, the spot had assumed a green-blue color at the end of 60 seconds.

From the above, it is evident that the chromate coated metals were more resistant to the development of the green-blue spot.

This application is a continuation-in-part of my co-pending application Serial No. 518,367, filed June 27, 1955, and now abandoned.

I claim:

1. A process of detecting the presence or absence of a chromate conversion coating on a metal comprising applying to said coated metal a drop of a solution in water of a water-soluble ferric salt and a water-soluble ferricyanide and containing sufficient acid to give a pH of 0.1 to 3.0, said solution being of amber color and the lack of or presence of a chromate conversion coating being indicated by the length of time taken for the amber test solution to turn a blue-green color when contacted with the metal coated surface.

2. A process of detecting the presence or absence of a chromate conversion coating on a metal comprising applying to said coated metal a drop of a solution comprising a soluble ferric salt and a soluble ferricyanide in an

inert solvent, said solution being of amber color and the lack of or presence of a protective film being indicated by the length of time taken for the amber test solution to turn a blue-green color in contact with the metal coated surface.

3. A process according to claim 2 wherein the inert solvent is water.

4. A process according to claim 1 wherein the solution contains 0.1 to 10 grams per liter of ferric salt and 0.1 to 10 grams per liter of ferricyanide.

5. A process according to claim 1 wherein the solution contains 0.1 to 10 grams per liter of ferric chloride and 0.1 to 10 grams per liter of ferricyanide.

6. A process according to claim 1 wherein the solution contains 0.1 to 10 grams per liter of ferric sale and 0.1 to 10 grams per liter of potasium ferricyanide.

7. A process according to claim 1 wherein the solution contains 0.1 to 10 grams per liter of ferric chloride and 0.1 to 10 grams per liter of potassium ferricyanide.

References Cited in the file of this patent

Vogel: "Qualitative Chemical Analysis," 3d ed., 1945, Longmans, Green and Co., N.Y., page 186.