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Specifications of Zinc/Chromate coatings

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Foreword

Appendix A and B in this Standard are informative.

This Standard was proposed by the China Machinery Industry Federation.

This Standard shall be under the jurisdiction of the China Standardization Technology Committee of Metallic and Non-metallic Coatings.

The responsible drafting organizations of this Standard: Wuhan Research Institute of Materials Protection, and Nanjing Hongguang Parachute Equipment Factory.

The participating drafting organizations of this Standard: Wuhan Yongtaihe Metal Anticorrosion Technology Co., Ltd., and Beijing Yongtaihe Metal Anticorrosion Technology Co., Ltd.

The main drafters of this Standard: Wu Yong, Xue Zhongyou, Zhang Weiming, Li Chunyan and Zhang Hongwei.

Specifications of Zinc/Chromate coatings

1 Scope

This Standard specifies the technical requirements and test methods of zinc/chromate coatings of steel parts and components.

2 Normative References

The following normative documents contain the provisions which, through reference in this text, constitute the provisions of this Standard. For the dated reference, the subsequent amendments (excluding corrigendum) or revisions of these publications do not apply. However, the parties who reach an agreement based on this Standard are encouraged to use the latest edition of these documents. For undated references, the latest edition of the normative document referred to applies.

GB/T 5270-1985 Metallic Coatings on Metallic Substrates - Electrodeposited and Chemically Deposited Coatings - Review of methods available for testing adhesion (eqv ISO 2819:1980)

GB/T 6462 Metallic and oxide coatings - Measurement of Coating Thickness - Microscopical method (eqv ISO 1463)

GB/T 10125-1997 Corrosion Tests in Artificial Atmospheres - Salt Spray Tests (SS) (eqv ISO 9227:1990)

3 Definition

The following definition is applicable to this Standard.

Zinc/Chromate coatings

Using water-based zinc/chromate coatings to dip-coat, brush-coat or spray onto the surface of steel parts or components, then it is baked to form into the **inorganic anticorrosion coating** of which the main ingredients are the flake zinc and zinc chromate.

4 Classification

The zinc/chromate coatings are divided into 4 classes shown in Table 1 according to the

6.2 Coating quantity and coating thickness

The coating quantity and coating thickness of different classes shall not be lower than the requirements specified in Table 1.

6.3 Adhesion strength

The coating must not be peeled off and bottom-exposed, after conducting adhesion strength test for coating according to the method in 8.3. However, it is allow that the adhesive tape is color-change and and is adhered with zinc and aluminum dust granules.

6.4 Salt spray corrosive resistance property

For different class of coating, after conducting salt spray test, the time of appearing red rust shall not be lower than the requirements specified in Table 2.

Table 2 The test requirements of salt spray corrosive resistance

Coating class	1	2	3	4
Time of appearing red rust /h	120	240	480	1000

6.5 Water resistant test property

For class 3 and 4 coatings, after it is conducted for water resistant test according to the requirements of 8.5, the coating must not be peeled off from the matrix or bottom-exposed. For class 1 and 2 coatings, it is exempted from water resistant test.

6.6 Moist-heat proof property

For class 3 and 4 coatings, after it is conducted for moist-heat resistant test according to the requirements of 8.6, red-rust must no appear in 240h. For class 1 and 2 coatings, it is exempted from moist-heat resistant test.

7 Sampling

7.1 In the same batch of products, it is required to randomly sample 3 samples for each test for experiment. If any sample among which is nonconformance after testing, then it is required to randomly sample another 3 samples to conduct the same test one more time. If there is any sample is still nonconformance, then this batch of products shall be deemed as nonconformance.

7.2 For assembly OR part or component of which the mass of single-part exceeds 150 g, it may cut a part of the workpiece as the sample for testing. In order to avoid the matrix of bare steel at incision impacting the test result, it shall adopt coating, wax or adhesive tape to protect the incision. For the part with complicated shape and difficult to determine its surface area, it may adopt the same method to prepare the sample.

8 Test methods

8.1 Appearance

To inspect with the naked eye under the nature diffused light.

8.2 Coating and test

8.2.1 Dissolve weight method

For the sample of which the mass is large than 50 g, adopt balance of which the precision is 1 mg to weigh its original mass W_1 (mg). Place the sample into the water solution with 70°C~80°C 20% NaOH water solution; soak for 10 min; make the zinc/chromate coatings dissolve fully. Take out the sample; wash in water adequately; dry immediately; then weigh the mass W_2 (mg) of sample of which the coating has been dissolved. Measure and calculate the surface area $S(\text{dm}^2)$ of the workpiece; calculate the coating quantity W_s (mg/dm²) according to the following formula:

$$W_s = \frac{W_1 - W_2}{S}$$

The calculation method of coating surface area of general parts shall refer to Appendix A.

Note 1: If the mass of sample is less than 50g, it shall accumulate some samples to reach above the mass of 50g, then conduct coating test.

Note: After the zinc/chromate coatings are dissolved in the solution of NaOH for 10 mins, it shall prolong the soaking time, until the coating is fully dissolved.

8.2.2 Metallographic microscope method

Adopt metallographic microscope method to inspect the coating thickness according to the requirements of GB/T 6462.

8.3 Adhesion Strength Test

Adopt adhesive tape test method to inspect the adhesive strength between zinc/chromate coatings and matrix; the tape test shall be conducted according to the requirements of Clause 1.4 in GB/T 270-1985.

8.4 Salt spray test

The salt spray test shall be conducted according to the requirements of Clause 3.2.1 in GB/T 10125-1997.

8.5 Water resistant test

Soak the sample into de-ionized water of $40^{\circ}\text{C} \pm 1^{\circ}\text{C}$; continuous soak for 240h; take out the sample; dry at room temperature; then, conduct the adhesive strength test according to the requirements of 8.3; the test result shall meet the requirements of 6.3. The adhesive strength test shall be conducted within 2h after the samples are taken out from de-ionized water.

8.6 Humid heat test

The humid heat test shall be conducted in humid heat test box; the humid heat test box shall be able to adjust and control the temperature and humidity.

Set the temperature of humid heat test box at $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and relative humidity at $95\% \pm 3\%$; hung the samples vertically in humid heat test box; the samples shall not be touched each other. When the humid heat test box reaches the set temperature and humidity, start to calculate the testing time. Continuously test for 48 h; then inspect once; inspect whether the red rust appears on the samples. After 2 times of inspection, inspect once for each 72 h. After each inspection, the position of samples shall be exchanged. After 240 h, conduct the last inspection.

Appendix B

(Informative)

The application and limit of zinc/chromate coatings

B.1 The application of zinc/chromate coatings

The zinc/chromate coatings is a kind of high anticorrosion coating; the production process have no pollution to the environment basically. Compared with electro galvanizing, electro tinning, hot galvanizing, the advantages and application of zinc/chromate coatings are as follows.

B.1.1 Better corrosion-resisting property

The corrosion-resisting property of zinc/chromate coatings is better than those of electro-galvanizing, electro-tinning and hot galvanizing; it can be used for the fastener with higher anticorrosion requirements or used at the severe corrosive condition (such as oceanic atmosphere, industry atmosphere and moist heat atmosphere, as well as the elasticity part and other parts and components of steel, aluminium and other alloy.

B.1.2 Be able to be used to multifold parts

The zinc/chromate coatings can be used for the surface protection of multifold of steel, cast iron, aluminium and their alloy, sintered iron basis power metallurgy, and so on.

B.1.3 Good heat-resistant property

The heat-resistant property of zinc/chromate coatings is better than those of electro-galvanizing, electro-tinning and hot galvanizing; It can maintain good corrosion-resisting property at higher temperature ($\leq 300^{\circ}\text{C}$); it can be used for the workpieces with stated heat-resistant requirements.

B.1.4 Not producing hydrogen brittleness

For the steel workpiece of high strength of which the tensile strength $R_m \geq N/\text{mm}^2$, it will not produce hydrogen brittleness when coating with zinc/chromate coatings. Adopting zinc/chromate coatings to replace electro galvanizing, electro tinning for the protection of the surface of these kinds of workpieces may avoid the hazard of hydrogen brittleness. In addition, in order to avoid the hydrogen brittleness, the preliminary treatment shall also adopt the processes such as solvent de-oiling, mechanical de-rusting which will not produce hydrogen brittleness.

B.1.5 Good deep-coating property

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