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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 9989.4-2015

**Vitreous and porcelain enamels -- Determination of resistance
to chemical corrosion -- Part 4: Determination of resistance to
chemical corrosion by alkaline liquids using a cylindrical vessel**

搪瓷耐化学侵蚀的测定 第4部分：用圆柱形容器进行耐碱溶液侵蚀的测定

(English Translation)

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Foreword

GB/T 9989 "Determination of enamel resistant to chemical attack" standard is divided into five parts.

- Part 1. Determination of acid erosion at room temperature;
- Part 2. resistant to boiling acids, boiling neutral liquids and their vapors Determination of chemical attack;
- Part 3. Hexagonal alkali solution container was measured erosion;
- Part 4. a cylindrical container with a solution of alkali was measured erosion;
- Part 5. Determination of resistance to chemical attack in a closed system.

This part of GB/Part 4 T 9989's.

This section drafted in accordance with GB/T 1.1-2009 given rules.

This section uses the translation method identical with ISO 28706-4:2008 "Determination of enamel resistant to chemical attack - Part 4. cylindrical vessel Alkali solution was measured erosion "(in English).

Consistency correspondence between this part of international documents and normative references of our files are as follows.

--- GB/T 6031-1998 Determination of vulcanized rubber or thermoplastic rubber hardness (10 ~ 100IRHD) (ISO 48:1994, IDT);

Laboratory water Specification and test methods (ISO 3696. 1987, MOD) --- GB/T 6682-2008 analysis;

--- GB/T 12806-2011 laboratory glassware single marking flask (ISO 1042-1998, NEQ).

For ease of use, this section made the following editorial changes.

Notes 5.1.2 adds the corresponding Chinese stainless steel number.

Please note that some of the content of this document may involve patents. Release mechanism of the present document does not assume responsibility for the identification of these patents.

This part is proposed by the China National Light Industry Council.

This part of the National food in direct contact with materials and products Standardization Technical Committee (SAC/TC397) centralized.

This section is drafted. Donghua University, the National Optical glass enamels Quality Supervision and Inspection Center.

Introduction

Aqueous solution of enamel and enamel erosion is a process of dissolution. Enamel main component is silica, it forms a three-dimensional silica Salt network, formed by the hydrolysis of silicic acid or silicates, silicic acid or silicates dissolve these to erode medium. Other components (mainly gold Metal oxide) will be hydrolyzed to form the corresponding metal hydroxide or hydroxide ions. All the products are eroded more or less to dissolve Aggressive medium, the whole process will lead to erosion of material per unit area of weightlessness.

Some erosion and water erosion of the enamel surface was linear with time; there are also some erosion of the enamel surface water Erosion time logarithmic relationship. Only water erosion linear relationship, you can use the scientific method to accurately calculate the weight loss per unit area Rate $[g/(m^2 \cdot h)]$, and the erosion rate (mm/a).

Effect of water on the surface of enamel erosion is the most important factor enamel mass, temperature and pH. Limited solubility of silica Also played a certain extent. Here are erosion under different conditions in different types of enamel erosion.

a) at a temperature of 80 °C, similar to 0.1mol/L sodium hydroxide alkaline solution (see GB/T 9989.4, Chapter 9), enamel Silicate network by a greater erosion, silicates and most other components are dissolved in an alkaline hydrolysis solution, the amount of erosion and the test time is linear, and therefore, the test results can be (per unit area and per unit

of time with weight loss rate per unit area of Weightlessness) and erosion rate (mm/a) to represent.

b) at room temperature, similar to the citric acidic solution (see GB/T 9989.1, Chapter 9) or similar strong sulfuric acid solution Liquid (see GB T 9989.1, Chapter/Section 10), enamel silicate network by the small erosion in the enamel deposited on the surface in addition to two Other than the silicon oxide component is limited. After high acid test by enamel, the enamel surface was not observed significant changes. and After the acid test by poor enamel, the enamel surface will produce signs of erosion or rendered rough.

c) boiling in an acidic solution (see GB/T 9989.2), enamel silicate network eroded, silica and other enamel Components are dissolved into the solution, but lower the solubility of silica in the acidic solution. Erosion solution will be dissolved dioxide Silicon quickly saturated, there is deposited only on the enamel surface. Acid erosion will be inhibited, significantly decreased the rate of erosion.

Note: The test apparatus under glass in an acid attack will release silicate, also play a role in suppressing erosion.

In the gas phase experiments, the condensate formed in the surface of the sample does not contain any dissolved components of the enamel, effectively preventing such corrosion inhibition Role.

The following are examples of non-linear enamel erosion and linear erosion.

1) boiling citric acid (see GB/T 9989.2, Chapter 10) and 30% boiling sulfuric acid (see GB/T 9989.2, Chapter 11) Since the gas phase containing only trace amounts of acid, usually only test phase. Inhibitory Effect of acid erosion and invasion Erosion depends on the time trial, so the test results with weight loss per unit area is represented; it can not be calculated per unit area the weight loss rate.

Boiling hydrochloric acid (see GB/T 9989.2, Chapter 122) 20%) Since this is an azeotropic boiling acid concentration in the liquid phase and gas phase it is the same, so no liquid phase test.

Intense boiling provides no inhibitory aggregates, the amount of time and erosion test is linear, and therefore, the test the results fit with weight loss rate per unit area (weight loss per unit area and per unit time) and erosion rate (mm/a) to FIG.

d) test liquid (see GB/T 9989.5) at high temperature and pressure conditions, the acidic solution is severe erosion. To avoid Inhibition test time is limited to 24h, the higher the rate of acid erosion of enamel surface (the analog of the chemical in a reaction vessel Member), In addition, under these experimental conditions, the time is only a low silicon content of aqueous test solution was prepared, and the erosion test was A linear relationship. Thus, 20% hydrochloric acid (see GB/T 9989.5, Chapter 8), simulation test solution (see GB/T 9989.5, Chapter 10 Cap) or process fluid (see GB/T 9989.5, Chapter 11) The test results

can follow the weight loss rate per unit area (per unit area and weight loss per unit of time) to represent.

e) in boiling water (see GB/T 9989.2, Chapter 13), the silicate network is very stable. Enamel surface to penetrate the main Lord, the amount of dissolved silica is very limited. Such erosion can be represented by the vapor phase corrosion in the liquid phase, for a high resistance to corrosion Enamel, anti-erosion ability. But if the enamel chemical stability tests are relatively poor, the enamel surface will have an alkali metal ion analysis Out, thereby increasing the pH value of the solution, it increases the erosion of the liquid, so that liquid and vapor are able to get useful information.

f) due to erosion may be linear or non-linear, the test results for weight loss per unit area is represented, and the test should be given time.

g) For the standard detergent solution Test time 24h or 168h (see GB/T 9989.3, Chapter 9) test, because you can not really Whether a given erosion curve is linear, so can not be included in the test report erosion rate calculations.

h) For other acidic solution (see GB/T 9989.2, Chapter 14) and an alkaline solution (see GB/T 9989.3, Chapter 10 GB T 9989.4, Chapter/Section 10), because during the test did not know whether the erosion rate is linear, so in this standard the test report can not contain the erosion rate calculations.

For the enamel firing temperature lower than 700 °C material of the GB/T 9989 test parameters (medium, temperature and time) it is not appropriate for in this type of enamel (such as aluminum enamel) should use other media, temperature, and (or) time. These tests can be based on GB/T 9989 Part 1, Part 2, Part 3 program and "other test solution" Part 4 to be described.

Determination of enamel resistant to chemical attack Part 4. alkali solution using a cylindrical vessel Determination of erosion

1 Scope

This section GB/T 9989 sets out at 25 °C ~ 95 °C test temperature, measured enamels alkali solution using a cylindrical vessel Standard Test Method for erosion, which can only be a test apparatus enamel samples for testing.

Note 1: This method was originally used to test material heat-resistant enamel chemical stability of the sodium hydroxide solution, within the scope of this section, you can also test other basic Chemical stability of the solution.

Note 2: As used in this section of the cylindrical container, generally used for chemical stability testing chemical enamel.