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

GB/T 9989.2-2025

Replacing GB/T 9989.2-2015

Vitreous and porcelain enamels - Determination of resistance to chemical corrosion - Part 2: Determination of resistance to chemical corrosion by boiling acids, boiling neutral liquids, alkaline liquids and/or their vapours

搪瓷耐化学侵蚀的测定 第2部分：耐沸腾酸、沸腾中性液体、碱性液体及其蒸气
化学侵蚀的测定

(English Translation)

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is Part 2 of GB/T 9989 "Determination of resistance of enamel to chemical attack". GB/T 9989 has been published in the following parts.

--- Part 1: Determination of resistance to acid corrosion at room temperature;

--- Part 2: Determination of resistance to chemical attack by boiling acids, boiling neutral liquids, alkaline liquids and their vapors;

--- Part 3: Determination of resistance to chemical attack by alkaline solutions using hexagonal containers or quadrilateral glass containers;

--- Part 4: Determination of resistance to erosion by alkaline solutions using cylindrical containers;

--- Part 5: Determination of resistance to chemical attack in closed systems.

This document replaces GB/T 9989.2-2015 "Determination of resistance of enamel to chemical attack - Part 2: Resistance to boiling acids, boiling neutral liquids and Compared with GB/T 9989.2-2015, in addition to structural adjustments and editorial changes, the main technical changes are as follows.

- a) Added alkaline liquids to the scope (see Chapter 1);
- b) Added reagents for testing purposes. sodium triphosphate, anhydrous sodium carbonate, sodium perborate, sodium silicate, alkyl sulfonate (see 5.7~ 5.11);
- c) Addition of alkaline solution (detergent) (see Chapter 15).

This document is modified to adopt ISO 28706-2:2017 "Determination of resistance of enamel to chemical attack - Part 2: Resistance to boiling acids, boiling neutral liquids, Determination of chemical attack by alkaline liquids and their vapors.

The technical differences between this document and ISO 28706-2:2017 and their reasons are as follows.

- a) The normative reference to ISO 649-1 (see Chapter 2, 6.2.7 of ISO 28706-2:2017) has been deleted to adapt to my country's technical requirements. parts, increasing operability;
- b) ISO 3696 (see 5.1) has been replaced by the normative reference GB/T 6682 to adapt to my country's technical conditions and increase operability. Sexuality;
- c) The normative reference GB/T 6579 replaces ISO 718 (see 6.1.2) to adapt to my country's technical conditions and increase operability. Sexuality;
- d) The normative reference GB/T 34843 replaces ISO 3585 (see 6.1.2~6.1.4, 6.1.14) to adapt to my country's technology Conditions, increase operability;
- e) The normative reference GB/T 28212 replaces ISO 4799 (see 6.1.3) to adapt to my country's technical conditions and increase operability. Sexuality;
- f) The normative reference GB/T 12804 replaces ISO 4788 (see 6.2.3) to adapt to my country's technical conditions and increase operability. Sexuality;
- g) Deleted the scale hydrometer. meet the requirements of ISO 649-1 (see 6.2.7 of ISO 28706-2:2017) to adapt to my country's technology Conditions, increase operability.
- h) ISO 48 (see 7.3) has been replaced with the normative reference GB/T 6031 to adapt to my country's technical conditions and increase operability;
- i) The normative reference GB/T 38166 replaces ISO 28764 (see Chapter 8) to adapt to my country's technical conditions and to add operability; The following editorial changes have

been made to this document.

--- The national standards used in the introduction replace the international standards. GB/T 9989.1-2015 replaces ISO 28706-1:2008,

GB/T 9989.3-2025 replaces ISO 28706-3:2008, GB/T 9989.5-2015 replaces ISO 28706-5:2010;

--- Increased the applicable scope;

--- Deleted "such as distilled water or water of equivalent purity" in 5.1 Test water of ISO 28706-2:2017;

--- Modified ISO 28706-2:2017 Chapter 14 titled "Boiling test water".

Introduction

GB/T 9989 is intended to describe the test method for the resistance of enamel to chemical attack and is intended to consist of five parts.

--- Part 1: Determination of acid corrosion resistance at room temperature. The purpose is to evaluate the chemical corrosion resistance of enamel in acidic environment at room temperature. Can and provide test methods.

--- Part 2: Determination of resistance to chemical attack by boiling acids, boiling neutral liquids, alkaline liquids and their vapors.

The corrosion resistance of porcelain under high temperature and the action of liquids of different chemical properties and their vapors is studied and the test methods are provided.

--- Part 3: Determination of resistance to chemical attack by alkaline solutions using hexagonal containers or quadrilateral glass containers.

The chemical corrosion resistance of enamel in alkaline solution environment in a container of a specific shape is evaluated and a test method is provided.

--- Part 4: Determination of resistance to alkali solution corrosion using cylindrical containers.

The test method for liquid corrosion is mainly applicable to chemical enamel.

--- Part 5: Determination of resistance to chemical attack in closed systems. The purpose is to determine the performance of enamels used in chemical treatment (processing) Assessment provides testing methods.

The erosion of enamel and porcelain glaze by aqueous solution is a hydrolysis process. The main component of the enamel layer is silicon dioxide, which is a three-dimensional silicon. The silicic acid or silicate formed after hydrolysis will dissolve into the corrosive medium. Other components (mainly metal oxides) will also hydrolyze and form the

corresponding metal hydroxide ions or hydroxides. All the eroded products will dissolve into the erosion medium to a greater or lesser extent.

The entire erosion process will result in a weight loss per unit area of the material.

There is a certain relationship between the amount of erosion on the enamel surface and the erosion time. Some aqueous solutions show a linear relationship, while others show a logarithmic relationship.

Only when the aqueous solution erosion is linear can the weight loss rate per unit area $[g/(m^2 \cdot h)]$ be accurately calculated using scientific methods. and erosion rate (mm/a).

The important factors that affect the corrosion of enamel surface by aqueous solution are the quality of enamel, temperature and pH. The limited solubility of silicon dioxide can also The following lists the corrosion conditions of different types of enamel under different corrosion conditions.

a) At 80°C, alkaline solution (such as 0.1 mol/L sodium hydroxide, see ISO 28706-4:2016 Chapter 9) has a significant effect on the silicate content of enamel.

The network erosion is obvious. Silicates and most other hydrolyzed components will dissolve in the alkaline solution. The erosion amount is proportional to the test time.

Therefore, the test results can be expressed as the weight loss rate per unit area (weight loss per unit area and per unit time) and the erosion rate. It is expressed in rate (mm/a).

b) At room temperature, a weak acid solution (such as citric acid, see Chapter 9 of GB/T 9989.1-2015) or a strong acid solution (such as sulfuric acid, see

GB/T 9989.1-2015 Chapter 10) has little erosion on the silicate network of enamel, and other components on the surface have a certain degree of decomposition.

It is found that after the test, no obvious changes are observed on the surface of the high acid-resistant enamel. However, after the test, the enamel with poor acid resistance is The surface may show signs of corrosion or appear rough.

c) In boiling acidic solutions (see this document), the silicate network of the enamel layer is attacked, and silicon dioxide and other enamel components are However, the solubility of silicon dioxide in acidic solution is low, and the dissolved silicon dioxide will quickly erode the solution.

The solution is saturated and only erosion and precipitation occur on the enamel surface. The acid erosion will be inhibited and the erosion rate will be significantly reduced.

Note: When the glass test device is corroded by acid, silicon dioxide will be precipitated, which also has a certain inhibitory effect on the corrosion of the enamel layer.

In the gas phase test, the condensate formed on the sample surface does not contain any dissolved enamel components, which effectively prevents this type of corrosion. role.