Chinastandards.org

ICS 31.030
CCS L 90

chinastandards.org - PREVIEW

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 6426-2025

Replacing GB/T 6426-1999

Quasi-static test method for ferroelectric hysteresis loop in ferroelectric ceramics

铁电陶瓷材料电滞回线的准静态测试方法

Issued on: August 29, 2025 **Implemented on: March 1, 2026**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Preview: page 1 of 5 shown, 15 in the full document. Complete English PDF, instant download:
https://chinastandards.org/standards/gb-t-6426-2025

Chinastandards.org

Table of Contents

chinastandards.org · PREVIEW

Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents". Drafting.

This document supersedes GB/T 6426-1999 "Quasi-static Test Method for Hysteresis Loop of Ferroelectric Ceramic Materials" and is consistent with GB/T 6426-1999.

In comparison, aside from structural adjustments and editorial changes, the main technical changes are as follows.

a) The testing equipment and requirements have been changed (see Chapter 5, 6.2 of the 1999 edition);

b) Test signal requirements have been changed (see 7.2, 5.3 of the 1999 edition);

c) The testing procedure was changed (see Chapter 8, 6.3 of the 1999 edition).

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed and is under the jurisdiction of the National Technical Committee on Standardization of Marine Ships (SAC/TC12).

This document was drafted by: China Electronics Technology Standardization Institute,

Preview: page 2 of 5 shown, 15 in the full document. Complete English PDF, instant download:
https://chinastandards.org/standards/gb-t-6426-2025

Haiying Enterprise Group Co., Ltd., and China Electronics Technology Group Corporation.

The 26th Research Institute of the Company.

The main drafters of this document are: Cao Kewei, Jiang Xingbing, Xian Xiaojun, Zhao Junsha, Zhang Hui, Li Ruifeng, Shi Zeyuan, Chi Wenchao, and Ge Ruibing.

This document was first published in 1986, revised for the first time in 1999, and this is the second revision.

Quasi-static hysteresis loop of ferroelectric ceramic materials Test methods

1 Scope

This document describes a quasi-static test method for the hysteresis loop of ferroelectric ceramic materials.

This document applies to the testing of hysteresis loops in ferroelectric ceramic materials, and the determination of the coercive electric field strength of the material from the measured hysteresis loops.

(Ec), remanent polarization (Pr), and spontaneous polarization (Ps).

2 Normative references

GB/T 3389.1-1996

3 Terms and Definitions

The terms and definitions defined in GB/T 3389.1-1996 apply to this document.

4 Testing Principle

Under the action of an alternating electric field, the polarization intensity (P) of ferroelectric ceramic materials changes nonlinearly with the external electric field, and within a certain temperature range...

Within the electric field, the polarization intensity (P) is a two-valued function of the electric field intensity (E), exhibiting a hysteresis phenomenon, resulting in the polarization intensity (P) shown in Figure 1.

The curve showing the relationship between the electric field strength (E) and the electric field intensity is called the hysteresis loop.

As shown in Figure 1, the polarization intensity (P) increases nonlinearly along curve OB with increasing electric field. As the electric field continues to increase, the polarization intensity (P) along the curve...

Preview: page 3 of 5 shown, 15 in the full document. Complete English PDF, instant download:
https://chinastandards.org/standards/gb-t-6426-2025

The line BC changes slowly and tends to saturate, reaching saturation polarization intensity. The intersection of the tangent of BC and the P-axis represents the spontaneous polarization intensity in the absence of an electric field.

(Ps). After the electric field is completely removed, the polarization intensity (P) will not decrease to 0 along the BO curve, but will maintain a polarization value, which is called the remanent polarization intensity.

The polarization intensity (Pr) is the reverse electric field strength that reduces the polarization intensity back to zero. The coercive electric field strength (Ec) is the electric field strength required to reduce the polarization intensity back to zero. Further increasing the reverse electric field will decrease the polarization intensity.

The intensity increases in the opposite direction along the curve until the saturation point H. The reverse electric field decreases, and the polarization intensity changes along the curve HF. This cycle is repeated to obtain the hysteresis loop.

By analyzing the hysteresis loop, the spontaneous polarization (Ps), remanent polarization (Pr), and coercive electric field (Ec) of the ferroelectric ceramic material are obtained. Parameters such as these. Indexing symbol explanation.

E --- Electric field strength;

Ec --- Coercive electric field strength; P --- Polarization intensity;

Pr --- Residual polarization intensity;

Ps --- Spontaneous polarization intensity.

Figure 1.Schematic diagram of hysteresis loop

5 Testing Equipment

5.1 Ferroelectric Analyzer. Test frequency range 0.01Hz~1000Hz, variable waveform, maximum fatigue test frequency. 50kHz, output voltage...

Voltage ±12V, output current ±50mA.

5.2 High Voltage Amplifier. Output Voltage. -4kV~4kV, Output Current. -20mA~20mA, Slew Rate. 150V/μs, Output...

The voltage accuracy is better than 0.1% of full scale.

5.3 Sample testing platform. Temperature range. 0°C~200°C, temperature control error not greater than ±2°C. 5.4 Display.

6 Test Samples

The sample should be an unpolarized thin sheet with a diameter not exceeding 20 mm and

Preview: page 4 of 5 shown, 15 in the full document. Complete English PDF, instant download:
https://chinastandards.org/standards/gb-t-6426-2025

a thickness (t) not exceeding 1 mm. Both principal planes of the sample should be completely covered.

The metal layer serves as the electrode. The sample should be kept clean and dry.

7.1 Environmental Conditions

When measuring hysteresis loop, the sample should be immersed in a suitable insulating medium, such as silicone oil. Depending on the material and requirements, the measurement can be performed at different temperatures.

Quantity. The sample should be kept at the test temperature for no less than 1 hour before testing.

7.2 Test Signal

The test signal waveform should preferably be a sine wave or a triangular wave. The test frequency is generally selected to be within 10Hz. If the sample polarization intensity is too high...

If the frequency is too low, the test will be inaccurate. In this case, the test frequency can be selected to be above 100Hz.

chinastandards.org · PREVIEW

8 Test Procedures

Perform the test following these steps.

a) After connecting the test circuit as shown in Figure 2, place the sample in the sample test platform (5.3).

Figure 2.Schematic diagram of hysteresis loop test device and wiring.

b) Turn on the ferroelectric analyzer (5.1), turn on the high voltage amplifier (5.2), and confirm that all equipment indicators are normal.

c) Set the sample information according to the test requirements, and input the test parameters in the test interface, including. frequency, waveform, voltage, temperature, etc.

d) Begin the test. After the first test, the monitor will display the hysteresis loop graph and corresponding parameters. Increase the voltage and repeat.

The test continues until the hysteresis loop is complete and without any openings, and the saturation polarization intensity no longer increases. At this point, the hysteresis loop is considered saturated. And hysteresis loop.

e) Save the saturation hysteresis loop graph and parameters; the test is now complete.

9 Performance Parameter Calculation

Preview: page 5 of 5 shown, 15 in the full document. Complete English PDF, instant download:
https://chinastandards.org/standards/gb-t-6426-2025