

ICS 83.080.01
CCS G 31



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

GB/T 47879-2026

**Plastics - Fast differential scanning calorimetry (FSC) - Chip
calorimetry**

塑料 快速差示扫描量热 (FSC) 法 芯片量热法
(English Translation)

Issued on: July 2, 2026

Implemented on: February 1, 2027

Issued by: State Administration for Market Regulation

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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 is modified to adopt ISO 23976:2021 "Fast Differential Scanning Calorimetry (FSC) for Plastics - Chip Calorimetry".

Compared with ISO 23976:2021, this document has undergone the following structural adjustments.

---3.2 corresponds to 3.6 in ISO 23976:2021;

---Chapter 4 contains content corresponding to section 3.2 of ISO 23976:2021;

--- Section 5.1 corresponds to section 3.1 in ISO 23976:2021.

The technical differences between this document and ISO 23976:2021, and the reasons therefor, are as follows.

a) ISO 11357-1 (see Chapters 1, 3, 5.4, 5.5, 8.2 and 13) has been replaced by the normatively referenced GB/T 19466.1.

(Chapter), to adapt to my country's technological conditions and increase operability;

b) The terms "chip sensor," "chip calorimetry," "sample," and "test specimen" have been removed, and specifications have been added to the introductory texts for terms and definitions.

The referenced standard GB/T 2035 (see Chapter 3) is used to adapt to my country's technical conditions and increase operability;

c) The requirements for specimen quality have been changed (see Chapter 4) to better suit actual test conditions and increase operability;

- d) Requirements for sample quality have been added (see Chapter 6), emphasizing the range of sample quality selection to facilitate the application of this document;
- e) An explanation of Figure 5 has been added (see 8.2.3), emphasizing the importance of sampling quality requirements and facilitating the application of this document;
- f) Added "Calibrate according to the method specified in GB/T 19466.1" (see 8.4), providing a specific calibration reference document and adding steps.

The completeness of the steps facilitates the application of this document;

- g) Change "Process the recorded data according to the thermal effects obtained from the instrument manufacturer's instructions and relevant materials" to "According to..." the GB/T 19466 series of standards specifies the processing of recorded data. (See 9.3.4), providing specific data processing reference documents and adding...

Operability, facilitating the application of this document;

- h) ISO 11357-3 (see 10.2, 12.4) has been replaced with the normatively referenced GB/T 19466.3 to adapt to my country's technical requirements.

Add components to increase operability;

- i) ISO 11357-5 (see 10.3) has been replaced with the normatively referenced GB/T 19466.5 to adapt to my country's technical conditions, and additional...

- j) ISO 11357-2 (see 10.4, 12.3) has been replaced with the normatively referenced GB/T 19466.2 to adapt to my country's technical requirements.

Add components to increase operability;

- k) ISO 11357-4 (see 12.2) has been replaced with the normatively referenced GB/T 19466.4 to adapt to my country's technical conditions, and additional...

Operability;

- l) Change "Test Date" to "Test Personnel and Date" (see Chapter 14) to increase operability.

The following editorial changes have been made to this document.

- a) The text "Information on thickness, temperature gradient and scan rate" is changed to Note 1, Note 2 and Note 3 (see Chapter 1);
- b) The scope description has been refined (see Chapter 1);
- c) Notes 1 and 2 have been deleted (see Chapter 1 of ISO 23976:2021);
- d) Change "Sensor heat capacity is independent of sample" to note (see 3.2);
- e) The description of the principle is more detailed (see Chapter 4);
- f) The equipment name in this document shall be uniformly referred to as "Fast Differential

Scanning Calorimetry (FSC) Instrument" (see 5.1, 8.2.2, 8.2.3, 8.2.4, 8.3.2, and Chapter 13);

g) The information regarding environmental conditions for equipment placement has been changed to Note 1 and Note 2 (see 7.1);

h) The information on the three liquid crystal materials reported in the literature for checking the temperature symmetry of rapid scanning calorimeters is changed to note (see 8.3.1);

i) Added "Note. This operation may damage the chip sensor." (See 9.2);

j) Change "Use FSC reference specimen" to "Estimate specimen mass based on known FSC specimen mass" (see 12.6);

k) The description of the precision data has been summarized, and the "Information on Precision" has been changed to a note (see Chapter 13).

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 by the China Petroleum and Chemical Industry Federation.

Introduction

This method measures the thermal properties of minute samples (such as thin films and bulk materials) at ultra-high speeds (104 K/s). This type of quasi-adiabatic thermodynamic method can only be used for heating molds.

This method, by introducing gas as a thermally inert coolant, further extends the sensor technology to rapid cooling processes under non-adiabatic conditions.

A smaller sample mass can effectively avoid significant thermal hysteresis caused by increased scanning rate. Therefore, reducing the sample and heating element to a very small size is crucial.

The scanning rate working window of the orimetry (DSC) instrument has been expanded to more than 7 orders of magnitude.

Various studies have shown that the advancements in this technology are based on the ultrafast speeds of micro-electro-mechanical systems (MEMS).

The development of chip calorimeters. Table 1 lists their typical characteristics. Currently, many universities have used specific equipment to obtain data using this type of calorimeter.

The experimental results, and related research, have also promoted application development.

In recent years, microchip calorimeters based on power-compensated dual sensors have