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

GB/T 46838-2025

**Plastics - Determination of fracture toughness(GIC and KIC) at
moderately high loading rates(1m/s)**

塑料 高加载速率 (1m/s) 下断裂韧性 (GIC和KIC) 的测定

(English Translation)

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Table of Contents

Preface
Introduction
1 Scope
2 Normative References
3 Terms and Definitions
4 Sample
5 Test conditions
6 Test equipment
7 Dynamic Effect Control
8 Data Processing
9 Result calculation representation
10 Precision
11 Test Report
Appendix A (Informative) Tests on Plastics Containing Short Fibers
Appendix B (Informative) Estimation of Force-Time Curve Fitting Parameters
Appendix C (Informative) Recommended Test Report Form
References

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 17281:2018 "Determination of fracture toughness (GIC and KIC) of plastics at high loading rates (1 m/s)".

Compared with ISO 17281:2018, this document has undergone the following structural adjustments.

---Appendix A corresponds to Appendix C in ISO 17281:2018;

---Appendix B corresponds to Appendix A in ISO 17281:2018;

---Appendix C corresponds to Appendix B in ISO 17281:2018.

The technical differences between this document and ISO 17281:2018, and the reasons

therefor, are as follows.

---Change the third-to-last and second-to-last paragraphs in the scope of ISO 17281:2018 to notes (see Chapter 1), in order to conform to my Following national standard drafting practices, this document's scope of application was not explicitly specified in its content; therefore, ISO 17281 was deleted.

The last paragraph of the 2018 scope (see Chapter 1) repeats the requirements of section 4.1 of this document;

---ISO 13586:2018 has been replaced by the normatively referenced GB/T 41932-2022 (see Introduction, Chapter 1, Chapter 3, Chapter 4).

5.3, 6.2, 8.1, 8.2, Chapter 9 and Appendix C), the degree of consistency between the two documents is modified to adapt to my country's technical conditions.

Improve operability;

---The heading of section 5.2 in ISO 17281:2018 has been changed to accurately describe the content of this clause; paragraph 2 of this clause has been changed to a note.

This conforms to the standard drafting conventions of my country; the last paragraph of this clause has been deleted, as its content overlaps with the requirements of Chapter 11 of this document.

(See 5.2);

---Change the first sentence of the first paragraph of section 6.3 in ISO 17281:2018 to a note (see 6.3) to conform to the writing conventions of Chinese standards.

The content only provides supplementary explanations regarding the regulations for instruments and apparatus;

---Change the last sentence of the first paragraph of section 8.1 in ISO 17281:2018 to a note (see section 8.1) to conform to the writing habits of Chinese standards.

The following editorial changes have been made to this document.

---Change the first four paragraphs of the scope of ISO 17281:2018 to the introduction of this document;

---Added note (see 8.2.2);

---Added note (see Chapter 11).

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.

This document is under the jurisdiction of the National Technical Committee on Plastics

Standardization (SAC/TC15).

Introduction

This document specifies and provides methods for determining the fracture toughness of plastics under crack opening modes (Mode I) using linear elastic fracture mechanics (LEFM) methods.

This document provides principles and guidelines for sexuality. It is an extension of GB/T 41932-2022, applicable to displacement rates up to 1 m/s, in order to...

The scope of application is extended to situations with loading rates slightly higher than those specified in GB/T 41932-2022.

Due to dynamic effects, fracture testing at high loading rates presents unique challenges. vibrations in the testing system can cause recording issues.

The data oscillates, and the force generated by the inertial load on the sample differs from the force measured by the device's sensors. These effects need to be controlled, or...

When conditions permit, these effects can be reduced through appropriate treatments, or the measured data may need to be properly analyzed to account for these effects.

The relative importance of this effect increases with increasing test rate (decreasing test duration). At rates less than 0.1 m/s...

When the loading time is greater than 10ms, the dynamic effect is not significant, and the method specified in GB/T 41932-2022 is generally followed. At the rate connection...

At speeds close to 1 m/s (loading time approximately 1 ms), dynamic effects may become significant, but remain manageable. Despite some limitations, at this point...

The basic methods specified in GB/T 41932-2022 remain applicable; however, these limitations are discussed in this document. (Several meters per second or higher) at loading rates significantly shorter than 1 ms, the dynamic effect is very pronounced, exceeding the limits of other fracture toughness determination methods.

The scope of the file.

Unless otherwise expressly stated in this document, GB/T 41932-2022 provides the general principles, methods, and procedures for low-loading rate fracture testing.

The rules still apply.

Fracture toughness of plastics at high loading rates (1 m/s) Determination of (GIC and KIC)

1 Scope

This document specifies and provides methods for determining crack tension using linear elastic fracture mechanics (LEFM) when the loading displacement rate is up to 1 m/s.

Principles and guidelines for fracture toughness of plastics under open mode (Mode I).

This document applies to materials with the same scope as GB/T 41932-2022, namely.

--- Rigid and semi-rigid thermoplastic molding, extrusion, and casting materials;

--- Rigid and semi-rigid thermosetting molding and casting materials.

And composite materials containing short fibers with a length of 7.5 mm or less.

Note 1: It is generally believed that short fibers with a length of 0.1 mm to 7.5 mm lead to non-uniformity and anisotropy in the crack tip region during fracture. Therefore, with Similar to Appendix B of GB/T 41932-2022, Appendix A also provides that, under specified conditions, the scope of application of the same test procedure extends to cases containing such...

Testing of short-fiber rigid and semi-rigid thermoplastic or thermosetting plastics.

Note 2: Although the dynamic effects occurring at high loading rates depend to a large extent on the material being tested, as well as the geometry of the test equipment and the specimen, the test methods and data processing methods presented in this document are valid and are not affected by test equipment, specimen size, or materials.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

This document.

GB/T 41932-2022 Determination of fracture toughness (GIC and KIC) of plastics - Linear elastic fracture mechanics (LEFM) method (ISO 13586.

2018, MOD)

3 Terms and Definitions

The terms and definitions defined in GB/T 41932-2022 apply to this document.