

ICS 83.080.01

CCS G 31



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

GB/T 47624-2026

**Plastics - Determination of mode I plane-strain crack-arrest
toughness**

塑料 I 型平面应变止裂韧度的测定

(English Translation)

Issued on: May 25, 2026

Implemented on: December 1, 2026

Issued by: State Administration for Market Regulation

Table of Contents

Preface	
Introduction	
1 Scope	
2 Normative References	
3 Terms and Definitions	
4 Principle	
5 Instruments	
5.1 General Rules	
5.2 Loading device	
5.3 Extensometer	
5.4 Dimensional measuring tools	
6 Sample	
6.1 General Rules	
6.2 Dimensions	
6.3 Initial Gap	
7 Experimental Procedures 6.	
7.1 State Adjustment	
7.2 Measurement of Specimen Dimensions	
7.3 Load	
7.4 Displacement Measurement	
7.5 Measurement of Crack Arrest Length (aa)	
7.6 Number of trials.	
8 Calculation and Verification Results	
8.1 Calculation of K_0 and K_{Qa}	
8.2 Validity Requirements	
9 Precision	
10 Test Report	
10.1 Experimental Details	
10.2 Calculation	
10.3 Validity Requirements	
10.4 Photographic Recording and Description of Fracture Surface	
Appendix A (Informative) Determination of initial crack length a_0 when using a V-notch	

Appendix B (Informative) Precision

Appendix C (Normative) Procedure for Measuring Crack Arrest Length (aa)

Appendix D (Informative) Acceptability of Fracture Surface

Reference

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 29221:2014 "Determination of plane strain arrest toughness of plastics of type I".

Compared with ISO 29221:2014, this document has undergone the following structural adjustments.

---Section 2 of General 6.1 corresponds to the content regarding specimen preparation in section 7.2 Conditioning of State of ISO 29221:2014;

---7.1 corresponds to 7.2 of ISO 29221:2014;

---7.2 corresponds to 7.1 of ISO 29221:2014;

---Appendix B corresponds to Appendix D of ISO 29221:2014;

---Appendix C corresponds to Appendix B of ISO 29221:2014;

---Appendix D corresponds to Appendix C of ISO 29221:2014.

The technical differences between this document and ISO 29221:2014, and the reasons therefor, are as follows.

--- Paragraph 3 in Scope 1 of ISO 29221:2014 has been revised to a note (see Chapter 1) to suit my country's technical conditions;

---Adjust the footnotes in section 5.2 to be part of the main text (see section 5.2) to suit my country's technical conditions;

---Added normative reference GB/T 41932 (see 5.3) to enhance operability;

---Added dimension measurement tools (see 5.4) to improve operability;

---ISO 16012 (see 7.2) has been replaced with the normatively referenced GB/T 44535 to adapt to my country's technical conditions and increase operability.

Actual nature;

---ISO 527-1 (see 8.1, 10.1) has been replaced with the normatively referenced GB/T 1040.1 to adapt to my country's technical conditions, and has been expanded.

Operability;

---ISO 18872 (see 10.1) has been replaced with the normatively referenced GB/T 36805.1 to adapt to my country's technical conditions and add [further details needed].

Operability;

---The normative reference document GB/T 36805.2 (see 10.1) has been added to adapt to my country's technical conditions and increase operability.

The following editorial changes have been made to this document.

---Corrected the formula error in 8.1.

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

In recent years, there has been a growing interest in understanding the fracture behavior of polymer materials, leading to the development of numerous methods for evaluating fracture performance.

The relevant standards. Given that these standards provide crucial data for preventing fractures in polymer structural components and products, and offer guidance for materials research and development.

Therefore, it is necessary to incorporate other important fracture testing methods into the standard system. Of particular note is the assessment of a material's resistance to rapid cracking.

The test method for crack propagation capability, namely the ability of crack arrest to rapidly propagate cracks.

The stress intensity factor (K value) at the moment of crack arrest in a rapidly propagating crack is an indicator of a material's crack arrest capability. This is achieved through dynamic analysis.

The stress intensity factor value obtained by this method can be defined as crack-arrested fracture toughness (KA). To simplify the complexity brought about by dynamic effects, it is often...

A simpler static analysis method was used to determine the stress intensity factor within 1 ms to 2 ms immediately after crack arrest, thereby obtaining the crack arrest...

The fracture toughness estimate is denoted as K_a . By minimizing the macroscopic dynamic effects in the test, the difference between K_a and K_{Ia} can be controlled within a small range.

For cases where the crack front is in a plane strain state and the dynamic effect is small, measurements using laboratory-sized specimens have been successfully performed.

K_{Ia} is used to predict whether cracks in a structure have arrested and where they have arrested. Depending on the component design, load compliance, and crack abrupt change length, there are...

In some cases, dynamic analysis of rapid crack propagation events is needed to predict crack arrest behavior. In this context, the K_{Ia} value measured in this document can be used to determine the K value.

Below which values does the crack propagation rate reach zero? For specific applications of dynamic analysis, please refer to the references.

Determination of plane strain-arrested crack toughness of type I plastic

1 Scope

This document describes a method for determining the type I plane strain arrested crack toughness (K_{Ia}) of polymer materials, using a crack line wedge loading band.

The method of compact tensile testing of the groove is used to obtain a flat tensile separation rapid crack stopping segment with a satisfactory crack front.

This document uses static fracture analysis to determine the stress intensity factor within a short time after crack arrest, and its estimated value is K_a , when the dimensions satisfy...

When required, this estimate is the polymer type I plane strain-arrested crack toughness K_{Ia} .

Note: This document requires that the specimen planar dimensions be large enough to allow for linear elastic analysis. If the specimen does not exhibit rapid crack propagation and cessation, K_a is not valid.

The law is established.

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.