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

GB/T 46614-2025

**Metallic materials - Instrumented indentation test -
Determination of fracture toughness**

金属材料 仪器化压入试验 断裂韧度的测定

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Table of Contents

1.Scope	1
2 Normative References	1
3.Terms and Definitions	1
4.Symbols and Explanations	2
5.Principle	3
6.Testing machine	3
7 Sample	4
8.Experimental Procedure	4
9.Uncertainty of test results	7
8 References	10

Foreword

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1.Structure and Drafting Rules of Standardization Documents". Drafting. 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 Iron and Steel Association. This document is under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC183). This document was drafted by: Shandong University, Shandong Special Equipment Inspection and Research Institute Group Co., Ltd., Southeast University, and China National Petroleum Corporation. Engineering Materials Research Institute Co., Ltd., State Energy Group New Energy Technology Research Institute Co., Ltd., China University of Petroleum (East China), Metallurgical Industry Information Technology Co., Ltd. Information Standards Research Institute, Jiangsu Provincial Special Equipment Safety Supervision and Inspection Institute, Suzhou Thermal Power Research Institute Co., Ltd., Ningbo University of Technology, Baoshan Iron & Steel China Iron & Steel Co., Ltd., Anke Engineering Technology Research Institute (Beijing) Co., Ltd., Huizhou Jianwei Technology Co., Ltd., Chengdu Haiguang Nuclear Power Technology Service Co., Ltd. Service Co., Ltd., Shandong Antai Chemical Pressure Vessel Inspection Center Co., Ltd., Luoyang Shipbuilding Materials Research Institute (China Shipbuilding Group Co., Ltd.) (The 725th Research Institute of the Company). The main drafters of this document are. Wang Weiqiang, Zhang Tairui, Song Mingda, Wang Junlei, Ge Zhiqiang, Gao Xiongxiang, Du Jinfeng, Jiang Wenchun, and Hou Huining. Yu Feng, Fang Jian, Chen Mingya, Jiang Zuowen, Yang Bin, Du Zhuotong, Zhang

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Instrumented indentation testing methods are suitable for situations where material volume limitations make it inconvenient to process into standard specimens, especially for on-site testing of metal components. Testing. Compared with conventional fracture toughness tests using compact tensile specimens and three-point bending specimens, instrumented indentation testing yields fracture toughness... The degree of toughness reflects more the local mechanical properties of the tested metallic material, and is particularly suitable for evaluating local differences in material properties. It is a conventional fracture toughness test. This is a supplement and reference to the degree of fracture test method. This method is suitable for materials undergoing ductile fracture, i.e., those described by the J and delta in GB/T 21143. Materials exhibiting certain behaviors [1]. For materials with linear elastic fracture or cleavage fracture, GB/T 21143 or other methods should be used. Instrumented indentation test of metallic materials Determination of fracture toughness

1 Scope

GB/T 46614-2025 is the Chinese national standard covering getting fracture toughness out of an indentation - the continuously recorded load and depth, the energy of the indentation process, and the correlation to a toughness value on a component that cannot give up a standard specimen. First edition, and it belongs with the small punch method GB/T 29459.3-2025 issued the same day. In force from 1 May 2026. Issued on 31 October 2025, it has been in force since 1 May 2026.

This document specifies the principle, testing machine, specimen, test procedure, and test results of the instrumented indentation test for fracture toughness of metallic materials. Uncertainty and test reports. This document applies to the determination of fracture toughness of tough metallic materials by instrumented indentation test within the macroscopic range specified in GB/T 21838.1.

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 21838.1 Instrumented indentation test for hardness and material parameters of metallic materials-Part

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 A test method for obtaining the mechanical properties of metallic materials by continuously recording the test force-indentation depth curve when the indenter is pressed into the specimen.

3.2 spherical indenter The end is spherical and the end is integrated with the handle to form a pressure head.

3.3 The curve between the force applied to the indenter and the depth to which the indenter is perpendicularly pressed into the test surface of the material.

Note. As shown in Figure 1. Figure

1. Test force-indentation depth curve obtained by instrumented indentation test method