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

GB/T 21838.5-2025

**Metallic materials - Instrumented indentation test for hardness
and materials parameters - Part 5: Linear elastic dynamic
instrumented indentation testing (DIIT)**

金属材料 硬度和材料参数的仪器化压入试验 第5部分：线弹性动态仪器化压入试验（DIIT）

(English Translation)

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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 Part 5 of GB/T 21838 "Instrumented Indentation Tests for Hardness and Material Parameters of Metallic Materials".

The following sections have been released.

---Part 1: Test Methods;

---Part 2: Inspection and Calibration of the Testing Machine;

---Part 3: Calibration of Standard Blocks;

---Part 4: Test methods for metallic and nonmetallic coatings;

---Part 5: Linear Elastic Dynamic Instrumented Indentation Test (DIIT).

This document is equivalent to ISO 14577-5:2022 "Metallic materials - Instrumented indentation tests - Hardness and material parameters - Part 5: Linearity".

Elastic Dynamic Instrumented Indentation Test (DIIT) 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).

Introduction

The classic definition of hardness is a material's ability to resist indentation by another, harder material. Rockwell, Vickers, and Brinell hardness tests are used to measure hardness.

The results obtained in the Hardy hardness test are determined after the test force has been removed. Therefore, the elastic deformation of the material under the action of the indenter is ignored.

The impact.

GB/T 21838, "Instrumented Indentation Tests for Hardness and Material Parameters of Metallic Materials," is a conversion of the ISO 14577 series of international standards, aiming to...

The requirements for instrumented indentation testing for determining the hardness and material parameters of metallic materials are specified in the standards, covering test methods (including metallic and non-metallic coatings).

Tests of the cap layer, linear elastic dynamic instrumented indentation test, and heated instrumented indentation test, etc.; inspection and calibration of the testing machine; standard block calibration.

The classification criteria are proposed to consist of 6 parts.

---Part 1: Test Methods. The purpose is to establish an instrumented indentation test method for determining hardness and other material parameters of metallic materials. method.

---Part 2: Inspection and Calibration of the Testing Machine. The purpose is to establish the inspection and calibration procedures for testing machines used in instrumented indentation testing.

Precise method.

---Part 3: Calibration of Standard Blocks. The purpose is to establish the calibration of standard blocks used for indirect testing with an instrumented indentation testing machine.

method.

---Part 4: Test methods for metallic and nonmetallic coatings. The purpose is to establish the hardness and material properties of metallic and nonmetallic coatings.

An instrumented indentation test method for parameters.

---Part 5: Linear Elastic Dynamic Instrumented Indentation Test (DIIT). The purpose is to establish the linear elasticity of the hardness and material parameters of metallic materials.

Elastic dynamic instrumented indentation test method.

---Part 6: Instrumented Indentation Test with Heating. The purpose is to establish the instrumented indentation test with heating for determining the hardness and material parameters of metallic materials.

Experimental methods.

The formulation of GB/T 21838 (all parts) enables users to study both force and deformation during the plastic and elastic deformation processes of materials.

This method assesses the indentation properties of materials by monitoring the entire cycle of test force application and removal. It can determine the indentation characteristics compared to traditional hardness testing.

The equivalent hardness value is obtained. Importantly, this method can also determine the indentation modulus and hardness under elasto-plastic conditions. It does not require the use of by measuring the size of the indentation using optical methods, all of the above values can be calculated.

This document aims to help users reliably measure indentation when using dynamic indentation testing technology to improve instrumented indentation testing techniques.

Hardness and indentation modulus.

Hardness and material parameters of metallic materials Instrumented indentation test, Part 5.

Linear elastic dynamic instrumented indentation test (DIIT)

1 Scope

This document specifies the stacking process during which the pressing force or displacement is kept at a constant target value or continuously loaded to a specified target force or displacement value.

A linear elastic dynamic instrumented indentation test method for determining the indentation hardness and indentation modulus of elasto-plastic materials by applying oscillation force or displacement.

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.

ISO 14577-1 Instrumented indentation tests on hardness and material parameters of metallic materials-Part 1: Test methods Note. GB/T 21838.1-2019 Instrumented indentation tests on hardness and material parameters of metallic materials-Part 1: Test methods (ISO 14577-1.

2015, IDT)

ISO 14577-2 Instrumented indentation testing of hardness and material parameters of metallic materials - Part 2: Inspection and calibration of testing machines Note. GB/T 21838.2-2022 Instrumented indentation test for hardness and material parameters of metallic materials - Part 2: Inspection and calibration of testing machines (ISO 14577-2:2015, IDT) ISO 14577-3 Instrumented indentation testing of hardness and material parameters of metallic materials-Part 3: Calibration of standard blocks (Metal-Note. GB/T 21838.3-2022 Instrumented indentation tests for hardness and material parameters of metallic materials-Part 3: Calibration of standard blocks (ISO 14577-3:2015, IDT) ISO 14577-4 Instrumented indentation tests for hardness and material parameters of metallic materials - Part 4: Metallic and nonmetallic coatings Note. GB/T 21838.4-2020 Instrumented indentation tests for hardness and material parameters of metallic materials-Part 4: Tests for metallic and nonmetallic coatings Test method (ISO 14577-4:2016, IDT)

3.1 Terms and Definitions

The terms and definitions defined in ISO 14577-1, ISO 14577-2, ISO 14577-3 and ISO 14577-4 apply to this document.

3.2 Symbols and Explanations

The following symbols apply to this document (see Table 1).