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Metallic materials - Indentation test - Determination of strength, hardness and stress-strain curve

金属材料 压入试验 强度、硬度和应力-应变曲线的测定

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Table of Contents

Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard was proposed by the China Iron and Steel Association. This standard is under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC183). This standard was drafted. Southwest Jiaotong University, Metallurgical Industry Information Standards Institute, Chengdu Weili Tes Technology Co., Ltd., Shenyang Aircraft Industrial (Group) Co., Ltd., Baoshan Iron and Steel Co., Ltd., Guohe General Testing and Certification Co., Ltd., China Aerospace Beijing Aviation Materials Materials Research Institute. The main drafters of this standard. Cai Lixun, Bao Chen, Chen Hui, Dong Li, Li Rongfeng, Liu Xiaokun, Yu Nanyang, Jin Dongyan, Fang Jian, Li Wei, Hu Benrun.

The existing instrumented indentation test method is based on the real-time measurement of the pressing force and depth, and realizes the hardness and elastic modulus of the metal material. The material parameters were determined, but the stress-strain curve could not be determined. Based on this standard, the stress-strain curve of the uniform deformation stage can be entered. Effective characterization [2-4], at the same time in the test principle, test methods, data processing and other aspects of the specification, mainly reflected in.

--- Based on the indentation test force-depth real-time measurement curve, the elastic modulus of the material to be tested can be obtained by the established mechanical model, Tensile strength, hardness and stress-strain curve;

--- to achieve conversion between Brinell, Rockwell, Vickers hardness;

--- Realize the conversion between tensile strength and Brinell, Rockwell and Vickers hardness. This standard provides a stress-strain curve for determining the elastic modulus, tensile strength, Rockwell hardness and uniform deformation of metallic materials.

Indentation test method. Metal material is pressed into the test strength, hardness and Determination of stress-strain curve

1 Scope

China's national standard for the instrumented indentation test used to determine strength, hardness and the stress-strain curve of metallic materials. It specifies the terms and definitions, the symbols, the test principle, the equipment, the specimens, the procedure and the evaluation. A conventional tensile test requires a specimen machined to shape, which means cutting material out of the component - so it cannot be done on a part in service, on a weld, or on anything that must stay whole. Instrumented indentation presses a hardened indenter into the surface while recording force and depth continuously, and from that curve the material's flow properties can be recovered. The measurement is small enough to be effectively non-destructive and can be made on a plant item in situ, which is why it has become the practical way to assess ageing in power station steels and pipelines. Its weakness is that the inference from indentation to stress-strain curve depends on a model, which is exactly what the standard has to pin down.

This standard specifies the test principle and test design for determining the elastic modulus, tensile strength, hardness and stress-strain curve of metal materials by indentation method. Preparation, samples, test conditions, test procedures, validity of test results and test reports. This standard applies to the elastic modulus of metal materials with homogeneous exponential characteristics (power exponent constant) for homogeneous, isotropic and tensile hardening laws. Determination of the stress-strain curve of the amount, tensile strength, Rockwell hardness and uniform deformation stage, conversion between tensile strength and hardness, and cloth Conversion between hardness, Rockwell hardness and Vickers hardness.

Note. When used to determine the stress-strain curve of a metal material with a significant yielding platform or exhibiting linear hardening, the resulting test results may be larger. error.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article. Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 228.1 tensile testing of metallic materials - Part 1

GB/T 7997 Hardmetal Vickers Hardness Test Method

GB/T 10623 Metallic material mechanical properties test terminology

GB/T 21838.1 Metallic materials - Determination of hardness and material parameters -

Part 1 . Test methods

GB/T 21838.2 Metallic materials - Determination of hardness and material parameters - Part 2. Examination and calibration of test machines JJG139 Tension, Pressure and Universal Testing Machine Verification Procedure

3 Terms and definitions

The following terms and definitions as defined in GB/T 10623, GB/T 21838.1 and GB/T 21838.2 apply to this document.

3.1 Force-depth curve A curve between the force applied to the indenter and the depth at which the indenter is pressed vertically into the surface of the material.

Note. The force-depth curve is derived from the data acquired during the load-unload process. A typical force-depth curve is shown in Figure 1.