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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Polyethylene materials for piping systems - Determination of Strain Hardening Modulus in relation to slow crack growth

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1.Structure and Drafting Rules of Standardization Documents"

Drafting.

The translation method used in this document is equivalent to the adoption of ISO 18488.2015 "Applications related to slow crack growth with polyethylene materials for piping systems"

Test method for determination of variable hardening modulus".

The Chinese documents that have consistent correspondence with the normatively cited international documents in this document are as follows.

---GB/T 1040.1-2018 Determination of tensile properties of plastics Part 1.General rules (ISO 527-1.2012, IDT);

---GB/T 16825.1-2008 Inspection of static uniaxial testing machine Part 1.Tensile and (or) pressure testing machine force measuring system

Inspection and calibration (ISO 7500-1.2004, IDT);

---GB/T 12160-2019 Calibration of the extensometer system for uniaxial testing of metallic materials (ISO 9513.2012, IDT).

The following editorial changes have been made to this document.

---In order to avoid confusion, this document has been revised according to the actual technical content corresponding to the definition of the variable hardening modulus, and the "true strain" is revised as

"Stretch ratio" (see 3.12).

Introduction

In general, the life of polyethylene materials is related to the resistance to slow crack growth. Therefore, the life of polyethylene products such as pipes and fittings

Also related to it. Research by Kramer and Brown showed that the resistance to slow crack growth is a function of the yield stress and the ability of tether molecules to disentangle.

Comprehensive results. The disentanglement ability of a polymer is closely related to its resistance to slow crack growth.

The strain hardening modulus of the polymer is its intrinsic property, which characterizes the ability of the tether molecules to disentangle to a certain extent. Application of polyethylene

The strain hardening modulus is calculated from the stress-strain curve higher than the natural stretch ratio. Using a tensile test device equipped with an optical extensometer,

In order to obtain the stress-strain curve of the compression-molded sample relatively easily. The test time depends on the stretching rate, which is a constant value in each test, and

The resistance to slow crack growth of the test material itself is irrelevant.

The strain hardening modulus value can better quantify the slow cracking resistance of the material. Studies have shown that the strain of HDPE

The hardening modulus has a good corresponding relationship with the results of several other stress cracking test methods.

Polyethylene material for piping system

Related to slow crack growth

Determination of strain hardening modulus

1 Scope

This document specifies a method for measuring the strain hardening modulus to evaluate the slow crack growth resistance of polyethylene materials.

This document gives a method to obtain the strain hardening modulus by measuring the stress-strain curve of a compression molded sample. Detailed provisions of this document

The required equipment, accuracy and sample preparation methods are used to obtain valid data.

The test methods specified in this document are applicable to various polyethylene materials for pipes and pipe fittings, and the production technology of polyethylene, comonomers and catalysts.

The type of chemical agent is irrelevant.

Note. This method can be used for material development for other purposes.

2 Normative references

The content of the following documents constitutes an indispensable clause of this document through normative references in the text. Among them, dated quotations

Only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

This document.

ISO 527-1 Determination of tensile properties of plastics Part 1.General (Plastics-Determinationoftensileproper-

ties-Part 1.Generalprinciples)

ISO 7500-1 Inspection and Calibration of Static Uniaxial Testing Machines for Metallic Materials Part 1.Tensile and (or) Compression Testing Machines

Force system inspection and calibration (Metalicmaterials-Calibrationverificationofstaticuniaxial testingmachines-

Part 1.Tension/compressiontestingmachines-Calibrationandverificationoftheforce-measuring

system)

The calibration of the extensometer system in the uniaxial test of ISO 9513 metallic materials (Metalicmaterials-Calibrationofexten-

sometersystemsusedinuniaxialtesting)

3 Terms and definitions

The following terms and definitions apply to this document.

Note. The symbols and terms and definitions of this document are consistent with ISO 527-1 and/or ISO 7500-1.

3.1

Gaugelength

l0

The initial distance between the two markings in the middle of the sample.

Note. The unit is in millimeters (mm).

3.2

Thickness

The smaller initial size of the rectangular section in the middle of the specimen.

Note. The unit is in millimeters (mm).