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Plastics — Determination of environmental stress cracking (ESC) of polyethylene — Full-notch creep test (FNCT)

Plastiques — Détermination de la fissuration sous contrainte dans un environnement donné (ESC) du polyéthylène — Essai sur éprouvette entièrement entaillée (FNCT)

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastics*.

This second edition cancels and replaces the first edition (ISO 16770:2004), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the test conditions for bimodal PE materials with substantially increased crack-resistance have been extended on an alternative more aggressive detergent;

— the compression moulding conditions for 10 mm × 10 mm test specimen (Type A) have been modified;

— the specimen types have been updated, with injection moulded test specimens being included;

— precision data (repeatability) from interlaboratory testing have been included for Type A test specimen.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Since mid-2000, the full-notch creep test (FNCT) has been widely used as one of the tests characterizing the environmental stress cracking (ESC) of polyethylene (PE) materials used in demanding applications. Among current ESC tests, the FNCT is relatively simple, easy to perform and still a sensitive laboratory scale test method to characterize ESC resistance of PE materials. The advantage of FNCT is that it enables the evaluation of the whole PE product range by variation of test conditions (test specimen geometry, temperature, medium and load conditions).

The FNCT method was standardized in 2004 as a PE material property, with partial precision statement based on the repeatability for a 6 mm × 6 mm-cross-sectional test specimen (Type B). Since then, several interlaboratory tests have been performed, resulting in a repeatability statement for 10 mm × 10 mm-cross-sectional test specimen (Type A). Type A specimen is prepared by using modified compression moulding conditions, which give more consistent test results compared to the original moulding conditions.

In addition, due to recent development of new PE pipe materials, known as PE 100 RC, which exhibit substantially improved crack resistance, it became necessary to define test conditions for these materials. Testing of these materials using the conditions specified in the previous edition of this document (i.e. ISO 16770:2004) resulted in failure times of one year or longer. As a consequence, this document includes extended test conditions to cover PE materials with substantially increased crack resistance. This accelerated test procedure using extended test conditions allows failure times to be reduced substantially compared to conventional test conditions given in ISO 16770:2004. In addition, a good correlation between accelerated and conventional test methods was derived; see References [4], [7] and [9].

The FNCT is a material characterization and production monitoring test, which, by strictly maintaining the test conditions defined, enables relevant and reliable comparison among similar PE materials or group of PE materials.