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Raw rubber or unvulcanized compounds — Determination of green strength

Caoutchouc brut ou mélanges de caoutchoucs non vulcanisés — Détermination de la cohésion à cru

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

This third edition cancels and replaces the second edition (ISO 9026:2007), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

— the Normative references in Clause 2 have been updated.

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

The stress-strain properties of unvulcanized rubber (either a prepared mix or in the raw state) are important to certain processing operations in the rubber industry. These unvulcanized-rubber properties are frequently referred to as “green strength”, denoting that the final vulcanization cycle has not yet been achieved. The word “green” is thus a synonym for uncured or unvulcanized.

Green strength is determined primarily by the physical and chemical characteristics of polymers, such as molecular mass, tendency to crystallize, degree of branching, etc. It is also related to the compound formulation, particularly filler and plasticizer content and the presence of peptizers. It is a particularly important characteristic for all processing operations in which elongation predominates, for example elongation caused by the expansion of the green tyre during the building operation.

Green strength is dependent on the test piece preparation (thermal, mechanical), rate of extension and test temperature. Therefore, a single-point method cannot be expected to give correlation between green strength and processing behaviour over the whole range of processing conditions.

Raw rubber or unvulcanized compounds — Determination of green strength

WARNING 1 — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to determine the applicability of any other restrictions.

WARNING 2 — Certain procedures specified in this document might involve the use or generation of substances, or the generation of waste, that could constitute a local environmental hazard. Reference should be made to appropriate documentation on safe handling and disposal after use.

1 Scope

This document specifies a method for the determination of the green strength of raw rubber or unvulcanized rubber compounds using a tensile stress-strain test, the test pieces being prepared following standard test conditions or cut from calendered sheets.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 1795, *Rubber, raw natural and raw synthetic — Sampling and further preparative procedures*

ISO 2393, *Rubber test mixes — Preparation, mixing and vulcanization — Equipment and procedures*

ISO 5893:2019, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Specification*

ISO 23529:2016, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
green strength
resistance of raw or unvulcanized compounded rubber to tensile deformation or fracture and thereby a measure of the ability of a rubber or rubber compound to resist tensile distortion during processing and in fabrication, e.g. tyre-building operations

Note 1 to entry: Several types of curve can be obtained, depending on the nature of polymer (see Figure 1). Usually, the green strength is expressed in terms of the yield stress or maximum stress.