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Thermoplastic elastomers — Nomenclature and abbreviated terms

Élastomères thermoplastiques — Nomenclature et termes abrégés

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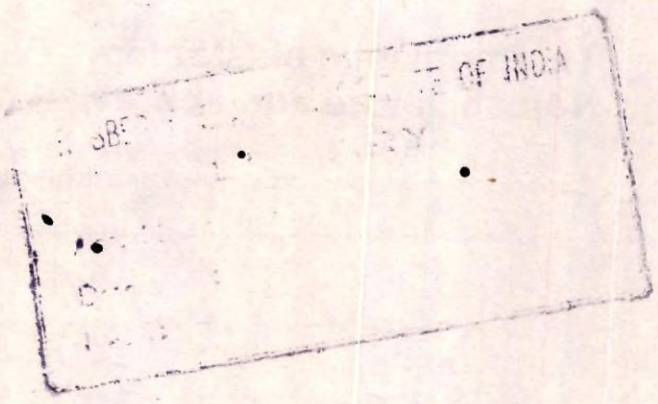

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Foreword

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 18064 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

Introduction

Thermoplastic elastomers combine many of the attributes and features of both vulcanized thermoset rubber and thermoplastic materials. It is, therefore, important that any system of classification and nomenclature for this rapidly expanding polymer sector should be acceptable to both the rubber and plastics industries. Neither of the existing standards for the nomenclature and abbreviated terms for rubber (ISO 1629) and for plastics (ISO 1043-1) is suitable for this purpose. The system in this International Standard has been devised to avoid any conflict of interests or ambiguity, permit the use of existing terms in the construction of abbreviations for thermoplastic elastomers, and allow for future developments or expansion.

This International Standard uses established abbreviated terms. Its aim is both to prevent the occurrence of more than one abbreviated term for a given thermoplastic elastomer term, and to prevent the interpretation of more than one meaning for a given abbreviated term. For this reason, this International Standard makes appropriate use of the terms and symbols listed in ISO 1043-1 and ISO 1629.

Thermoplastic elastomers — Nomenclature and abbreviated terms

1 Scope

This International Standard establishes a nomenclature system for thermoplastic elastomers based on the chemical composition of the polymer or polymers involved. It defines symbols and abbreviated terms used to identify thermoplastic elastomers in industry, commerce and government. It is not intended to conflict with, but to supplement, existing trade names and trademarks.

NOTE 1 The name of the thermoplastic elastomer should be used in technical papers and presentations followed by the abbreviated term used to designate the elastomer in this International Standard.

NOTE 2 Annex A gives thermoplastic-elastomer abbreviated terms that have been used in the past in materials standards, technical bulletins, textbooks, patents and trade literature.

2 Normative references

The following referenced documents are indispensable for the application 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 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

ISO 1629, *Rubber and latices — Nomenclature*

3 Generic terms and definitions

3.1 TPE

Thermoplastic elastomer, consisting of a polymer or blend of polymers that has properties at its service temperature similar to those of vulcanized rubber but can be processed and reprocessed at elevated temperature like a thermoplastic.

NOTE Thermoplastic rubber is a commonly used term for thermoplastic elastomer.

3.2 TP

Prefix used to identify that the abbreviated term is for a thermoplastic elastomer.

4 Nomenclature system

4.1 The prefix TP shall be followed by a letter representing each category of thermoplastic elastomer, as detailed in Clause 5.

4.2 The abbreviated term for each category of thermoplastic elastomer shall be followed, after a hyphen, by a combination of symbols to describe a specific member of each category, as detailed in Clause 6.

5 Categories of thermoplastic elastomer

5.1 TPA

Polyamide thermoplastic elastomer, comprising a block copolymer of alternating hard and soft segments with amide chemical linkages in the hard blocks and ether and/or ester linkages in the soft blocks.

5.2 TPC

Copolyester thermoplastic elastomer, consisting of a block copolymer of alternating hard segments and soft segments, the chemical linkages in the main chain being ester and/or ether.

5.3 TPO

Olefinic thermoplastic elastomer, consisting of a blend of a polyolefin and a conventional rubber, the rubber phase in the blend having little or no crosslinking.

5.4 TPS

Styrenic thermoplastic elastomer, consisting of at least a triblock copolymer of styrene and a specific diene, where the two end blocks (hard blocks) are polystyrene and the internal block (soft block or blocks) is a polydiene or hydrogenated polydiene.

5.5 TPU

Urethane thermoplastic elastomer, consisting of a block copolymer of alternating hard and soft segments with urethane chemical linkages in the hard blocks and ether, ester or carbonate linkages or mixtures of them in the soft blocks.

5.6 TPV

Thermoplastic rubber vulcanizate consisting of a blend of a thermoplastic material and a conventional rubber in which the rubber has been crosslinked by the process of dynamic vulcanization during the blending and mixing step.

5.7 TPZ

Unclassified thermoplastic elastomer comprising any composition or structure other than those grouped in TPA, TPC, TPO, TPS, TPU and TPV.

6 Materials in each TPE category

6.1 Polyamide TPEs (TPAs)

The "TPA" group is sub-categorized into groups according to the linkages in the soft blocks. The following symbols are used:

TPA-EE Soft segment with both ether and ester linkages

TPA-ES Polyester soft segment

TPA-ET Polyether soft segment

6.2 Copolyester TPEs (TPCs)

The "TPC" group is sub-categorized into groups according to the linkages in the soft blocks. The following symbols are used:

TPC-EE Soft segment with ester and ether linkages

TPC-ES Polyester soft segment

TPC-ET Polyether soft segment

6.3 Olefinic TPEs (TPOs)

The "TPO" group varies according to the nature of the thermoplastic polyolefin being used and the rubber type.

A specific TPO is identified by a bracketed term comprising the standard abbreviation for the rubber type (see ISO 1629), a "+" sign and the standard abbreviation for the thermoplastic type (see ISO 1043-1). The thermoplastic and the rubber type shall be listed in decreasing order of abundance in the TPO.

A commercially available TPO type is described as follows:

TPO-(EPDM+PP) Blend of ethylene-propylene-diene terpolymer with polypropylene, with no or little crosslinking of the EPDM phase, the amount of EPDM present being greater than that of PP

6.4 Styrenic TPEs (TPSs)

The following symbols are used for the "TPS" group:

TPS-SBS Block copolymer of styrene and butadiene

TPS-SEBS Polystyrene-poly(ethylene-butylene)-polystyrene

TPS-SEPS Polystyrene-poly(ethylene-propylene)-polystyrene

TPS-SIS Block copolymer of styrene and isoprene

NOTE TPS-SEBS is a block copolymer of styrene and butadiene in which the soft block comprises a mixture of hydrogenated *cis*-1,4-polybutadiene and 1,2-polybutadiene units. TPS-SEPS is a block copolymer of styrene and isoprene in which the polyisoprene block has been hydrogenated.

6.5 Urethane TPEs (TPUs)

The "TPU" group is sub-categorized into types according to the nature of the hydrocarbon moiety (aromatic or aliphatic) between the urethane linkages of the hard blocks, and according to the chemical linkages (ether, ester, carbonate) in the soft blocks. The following symbols are used:

TPU-ARES Aromatic hard segment, polyester soft segment

TPU-ARET Aromatic hard segment, polyether soft segment

TPU-AREE Aromatic hard segment, soft segment with ester and ether linkages

TPU-ARCE Aromatic hard segment, polycarbonate soft segment

TPU-ARCL Aromatic hard segment, polycaprolactone soft segment

TPU-ALES Aliphatic hard segment, polyester soft segment

TPU-ALET Aliphatic hard segment, polyether soft segment

6.6 Dynamically vulcanized TPEs (TPVs)

The "TPV" group varies depending on the nature of the thermoplastic material being used and the rubber type.

A specific TPV is identified by a bracketed term comprising the standard abbreviation for the rubber (see ISO 1629), followed by a "+" sign and the standard abbreviation for the thermoplastic type (see ISO 1043-1). The abbreviation for the rubber shall precede that for the thermoplastic.

Commercially available TPV types include:

TPV-(EPDM+PP) Combination of EPDM and polypropylene in which the EPDM phase is highly crosslinked and finely dispersed in a continuous polypropylene phase

TPV-(NBR+PP) Combination of acrylonitrile-butadiene rubber and polypropylene in which the NBR phase is highly crosslinked and finely dispersed in a continuous polypropylene phase

TPV-(NR+PP) Combination of natural rubber and polypropylene in which the NR phase is highly crosslinked and finely dispersed in a continuous polypropylene phase

TPV-(ENR+PP) Combination of epoxidized natural rubber and polypropylene in which the ENR phase is highly crosslinked and finely dispersed in a continuous polypropylene phase

TPV-(IIR+PP) Combination of butyl rubber and polypropylene in which the IIR phase is highly crosslinked and finely dispersed in a continuous polypropylene phase

6.7 Miscellaneous material (TPZ)

These thermoplastic elastomers do not fit into any particular class and are identified by the prefix TPZ. A commercially available TPZ type is described as follows:

TPZ-(NBR+PVC) Blend of acrylonitrile-butadiene rubber and poly(vinyl chloride)

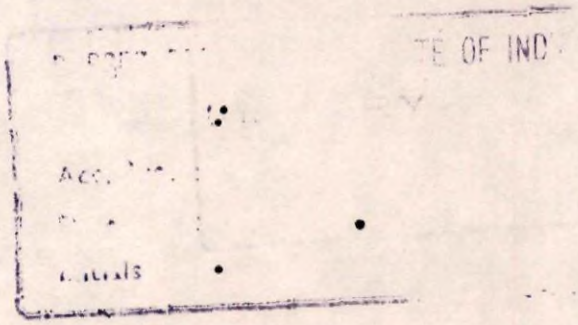
NOTE Many NBR+PVC blends are thermoset vulcanized rubbers, and with these the prefix TPZ should not be used.

Annex A
(informative)

Formerly used abbreviated terms

Over the years, many different types of thermoplastic material have been developed and (partially) commercialized. In the beginning, different ways were used to describe the representatives of the different classes of these materials. Some of the terms used to describe the materials have been used in the literature and in patents. This has led to the situation in which nowadays the same material is known under different terms. In order to permit a smooth transition to the newly developed standardized way of describing thermoplastic materials and maintain the link with already existing literature, a number of formerly used terms and abbreviations are given below:

Former term	New term	Description
FCEA	TPV	Fully crosslinked elastomeric alloy
HCTPV	TPV	Highly crosslinked thermoplastic vulcanizate
NPV	TPZ-(NBR+PVC)	Blend of NBR and PVC (abbreviation mainly used in India)
PEBA	TPA	Thermoplastic elastomer, polyether block amide
SBS	TPS-SBS	Styrene butadiene styrene block copolymer
SEBS	TPS-SEBS	Styrene ethylene/butylene styrene block copolymer
SEPS	TPS-SEPS	Styrene ethylene/propylene styrene block copolymer
SIS	TPS-SIS	Styrene isoprene styrene block copolymer
TECEA	TPZ-(NBR+PVC)	Thermoplastic elastomer, chlorinated ethylene alloy
TEEE	TPC	Thermoplastic elastomer, ether-ester
TEO	TPO	Thermoplastic elastomer, olefinic
TES	TPS	Thermoplastic elastomer, styrenic



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