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Rubber — Vocabulary

Caoutchouc — Vocabulaire

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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*.

This seventh edition cancels and replaces the sixth edition (ISO 1382:2012), which has been technically revised.

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

- in [Clause 3](#), terms have been redefined and new terms have been added;
- separate entries for abbreviated terms and synonyms (admitted terms) have been removed and incorporated into the preferred terms as single entries following ISO 10241-1:2011, which is the reference document for the presentation of entries in a vocabulary;
- an alphabetical index of terms has been added.

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

This document is intended to be helpful to persons who are unfamiliar with the terminology of the rubber industry. However, it is also intended for use as a guide by the rubber industry itself in selecting appropriate recommended terms to minimize possible confusions and for use in other International Standards and other reports and publications on rubber.

The vocabulary is limited to those terms in general use in the industry. It does not define terms intended for particular products of rubber nor does it define terms that are generally understood or adequately defined in other readily available sources such as general dictionaries.

Many rubber product areas have also produced International Standards on vocabulary specific to their products and processes, and a list of some of these vocabulary standards is given in the Bibliography.

Attention is also drawn to ISO 472 and ISO 18064 because these contain many terms of common interest to the rubber and plastics industries.

For convenience, standards and other relevant sources referred to in this vocabulary are listed in the first section of the Bibliography. Vocabularies relating to finished rubber products are listed in the second section of the Bibliography.

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Rubber — Vocabulary

1 Scope

This document establishes a vocabulary of and is limited to those terms in general use throughout the rubber industry.

It does not define terms intended for particular rubber products, some of which are given in the vocabulary standards listed in the Bibliography.

It does not define terms that are generally understood or adequately defined in other readily available sources such as general dictionaries.

The terms are listed in the alphabetical order of the English terms, with an index to the corresponding English terms attached.

Symbols are included under their full descriptions.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

abrasion

loss of material from a surface due to frictional forces

3.2

abrasion resistance

resistance to wear resulting from mechanical action upon a surface

Note 1 to entry: Abrasion resistance is often expressed by the *abrasion resistance index* (3.3).

3.3

abrasion resistance index

ratio of the loss in volume of a standard rubber due to frictional forces to the loss in volume of a test rubber measured under the same specified conditions and expressed as a percentage

Note 1 to entry: ISO 4649 contains a method for the determination of *abrasion resistance* (3.2) using a rotating drum device.

3.4
accelerated ageing

change in physical properties in a test environment intended to produce the effect of slow natural changes at an ambient temperature in a shorter period of time

Note 1 to entry: The rate of degradation is usually increased by raising the temperature, sometimes in combination with increased air or oxygen pressure, increased humidity and/or changes in other conditions.

3.5
accelerator

compounding ingredient (3.106) used in small amounts with a *vulcanizing agent* (3.543) to increase the speed of *vulcanization* (3.542) and/or enhance the physical properties of the *vulcanizate* (3.541)

3.6
acrylonitrile-butadiene rubber
nitrile rubber
NBR

oil-resistant rubber made by the *copolymerization* (3.115) of acrylonitrile and butadiene

Note 1 to entry: Oil resistance increases with the level of acrylonitrile, which in commercial nitrile rubber grades varies from 18 % to 49 %.

3.7
activator

compounding ingredient (3.106) used in small proportions to increase the effectiveness of an *accelerator* (3.5)

3.8
active zinc oxide

fine-particle form of zinc oxide chemical *activator* (3.7) for accelerated sulfur *vulcanization* (3.542)

Note 1 to entry: It is more effective than general-purpose zinc oxide at the low concentrations needed for the production of transparent or translucent *vulcanizates* (3.541) or the production of vulcanizates containing reduced levels of zinc.

3.9
addition polymerization

monomers (3.301) are linked together to form chains, without water or other simple molecules being split off

Note 1 to entry: See also *polyaddition* (3.367).

Note 2 to entry: There are two major types of addition polymerization process, polymerization of unsaturated compounds, such as olefins and dienes, and *polymerization* (3.370) of certain ring *structures* (3.493), such as lactams and alkylene oxides, by an opening of the ring to make large molecules.

3.10
additive

substance that is added into rubber *compounds* (3.105) to improve mixing or to modify properties of cured rubber

3.11
adhesion

state in which two surfaces are held together by chemical or physical forces or both

3.12
adhesion promoter

compounding ingredient (3.106) added to *unvulcanized rubber* (3.534) to improve bonding of rubber to another material in the *compound* (3.105)

Note 1 to entry: See also *bonding agent* (3.63).

3.13**adhesion strength**

force required to cause separation at the interface of the bonded components of a *test piece* (3.517) or product

3.14**aftercure**

continuation of process of *vulcanization* (3.542) subsequent to removal of the energy source

3.15**ageing**

<the effect of, or act of> exposure to an environment for a period of time and the irreversible change of material properties during that time

3.16**agglomerate**

<carbon black and other dry filler particles> group of *particle* (3.341) aggregates that are separated by normal rubber processing

3.17**agglomeration**

<rubber latex> reversible or irreversible joining together of *latex* (3.270) *particles* (3.341)

3.18**aggregate**

<carbon black and other dry filler particles> rigid group of coalesced *particles* (3.341) which is the smallest entity that can be dispersed by normal rubber processing

3.19**air checks**

laking

surface markings or depressions that occur on a moulding due to air trapped between the rubber and the mould surface

3.20**air oven ageing**

exposure in an enclosure to circulating air at elevated temperature, at atmospheric pressure and in the absence of light

3.21**anisotropic**

exhibiting different physical properties in different directions

[SOURCE: ISO 24817:2017, 3.1]

3.22**anti-blocking agent**

material used to prevent, or reduce the risk of, unwanted adherence between rubber surfaces

3.23**anticoagulant**

<natural rubber latex> substance added to field, or other, *latex* (3.270) to retard bacterial action and acidification which would otherwise cause rapid *coagulation* (3.94) of the latex

3.24**antidegradant**

compounding ingredient (3.106) used to retard deterioration during ageing

Note 1 to entry: Antidegradant is a generic term for certain *additives* (3.10) such as antioxidants, antiozonants, waxes and other protective materials.

3.25

anti-flex-cracking agent

compounding ingredient (3.106) used to retard cracking caused by cyclic deformation

3.26

anti-foaming agent

<rubber latex> *compounding ingredient* (3.106) used to prevent the formation of air bubbles in a *latex* (3.270) *mix* (3.298) which might otherwise cause *blisters* (3.54) or *pinholes* (3.357) in the finished product

3.27

antioxidant

compounding ingredient (3.106) used to retard deterioration caused by oxidation

3.28

antiozonant

compounding ingredient (3.106) used to retard deterioration caused by ozone

3.29

antistatic agent

material which counteracts the tendency for an electrical charge to build up on the surface of a product

3.30

anti-webbing agent

<rubber latex> *compounding ingredient* (3.106) used in a *latex* (3.270) *mix* (3.298) to prevent the formation of *webbing* (3.548) between adjacent parts of a dipped product

Note 1 to entry: See also webbing.

3.31

apparent hardness

stiffness measured on a *test piece* (3.517) of non-standard dimensions or on a curved surface

3.32

applied skin

<cellular material> thin surface layer of *elastomeric* (3.169) material applied to a cellular product

3.33

aromatic oil

hydrocarbon *process oil* (3.389) usually containing at least 35 % by mass of aromatic hydrocarbons

3.34

artificial weathering

exposure of material to laboratory conditions that accelerate the effect of natural climate-induced effects

3.35

ash

residue from incineration of a material under specified conditions

3.36

asphalt rubber

blend of polymeric cement, and any combination of *recycled rubber* (3.400), *raw rubber* (3.394), *rubber compound* (3.105) and certain *additives* (3.10) in which the rubber component is at least 5 % of the total blend and has reacted in the hot cement sufficiently to cause *swelling* (3.501) of the *rubber particles* (3.341)

Note 1 to entry: The term is widely used in the asphalt road surfacing industry, but the product is not an *elastomer* (3.167).

3.37

autoclave

pressurized vessel used for vulcanizing rubber in a vapour or gas

3.38**average particle diameter**

<carbon black and other particulate filler> arithmetic mean of the diameters of several individual *particles* (3.341) measured by an electron microscope

3.39**back-rind****retracted spew**

defect in which the rubber adjacent to the *flash line* (3.205) shrinks below the level of the moulded product

3.40**bagging**

tendency of a band of rubber on a mixing *mill* (3.295) to sag and rotate beneath the mill *roll* (3.415) due to lack of grip to the roll

3.41**balata**

tough flexible thermoplastic substance containing approximately equal proportions of *trans*-polyisoprene and *resin* (3.409), obtained from the sap of various trees of the *Sapotaceae* family, especially *Mimusops globosa*

3.42**bale coating**

film applied to surfaces of *natural rubber* (3.319) bales which inhibits adhesion to other surfaces and facilitates marking

3.43**ball mill**

rotating drum, usually mounted horizontally, containing hard, loose balls which serve to pulverize coarse material

3.44**bank**

accumulation of material at the opening between the *rolls* (3.415) of a *mill* (3.295) or *calender* (3.74) or at a *spreader bar* (3.470) or knife

3.45**bareness**

defect resulting from the failure of the rubber to fill out all the pattern detail of a mould

3.46**batch**

<compounding> product of one mixing operation

3.47**bay region hydrogen**

hydrogen in a characteristic three-sided concave area of a non-linear polyaromatic hydrocarbon with three or more fused rings

Note 1 to entry: For more information, see ISO 21461.

3.48**bench mark****reference mark**

mark of known separation applied to a *test piece* (3.517) and used to measure *strain* (3.486)

3.49**biobased content**

amount of biologically-derived component(s) in a product expressed by carbon percentage to total carbon or mass percentage to total product mass

3.50

biomass

material of biological origin excluding material embedded in geological formations and/or fossilized

3.51

black scorch

severe stiffening of a rubber *compound* ([3.105](#)) during processing, due to interactions between the polymer and carbon black

Note 1 to entry: The effect is similar to that of *scorch* ([3.431](#)) and can be a particular problem in *extrusion* ([3.189](#)) processes. The effect is most common in EPDM compounds.

3.52

blank

piece of rubber *compound* ([3.105](#)) of suitable shape and volume to fill the mould

3.53

bleeding

exudation of a liquid *compounding ingredient* ([3.106](#)) or material to the surface of a rubber

Note 1 to entry: See also *blooming* ([3.60](#)).

Note 2 to entry: The term is also used for the migration of liquid and solid *colourants* ([3.100](#)).

3.54

blister

defect in a *rubber product* ([3.426](#)) evidenced by a *crater* ([3.120](#)) or sac that deforms the surface

3.55

block

portion of a polymer molecule, comprising many constitutional units, that has at least one constitutional or configurational feature not present in adjacent portions

Note 1 to entry: The term is sometimes preceded by the word “soft” for an *elastomeric* ([3.169](#)) phase and by the word “hard” for a glassy or crystalline phase.

[SOURCE: IUPAC]

3.56

block copolymer

polymer containing sections of more than one constitutional *monomer* ([3.301](#)) type

3.57

block polymer

polymer whose disparate *monomers* ([3.301](#)) in sequence are connected linearly

[SOURCE: IUPAC]

3.58

blocking

unintentional adherence between materials

3.59

bloom

liquid or solid material which has migrated to the surface of a rubber

Note 1 to entry: Bloom changes the surface appearance of the rubber.

3.60

blooming

migration of liquid or solid material to the surface of a rubber

Note 1 to entry: See also *bleeding* ([3.53](#)).

3.61**blowing agent**

compounding ingredient (3.106) used to produce gas by chemical and/or thermal action in the manufacture of hollow or cellular products

3.62**blowing down**

<rubber latex> removal of excess ammonia from *latex* (3.270) by stirring the latex while passing a stream of air across the surface

3.63**bonding agent**

substance, usually in liquid form, coated onto another material and used to produce a good bond between the material and rubber

Note 1 to entry: See also *chemical bonding* (3.85) and *adhesion promoter* (3.12).

3.64**bound monomer**

individual molecule that is combined or reacted with itself or other types of molecules in a *polymerization* (3.370) reaction to form a polymer

Note 1 to entry: This term is used with reference to *synthetic rubber* (3.502), and the bound monomer is usually expressed as a percentage of the total polymer.

3.65**bound rubber**

portion of the *elastomer* (3.167) in a *mix* (3.298) which is so closely associated with the *filler* (3.196) as to be unextractable by the usual rubber solvents

3.66**bowl**

two or more cylinders forming the rotating members of a *calender* (3.74)

3.67**branched polymer**

molecules connected together having a branched *structure* (3.493), chainlike between branch junctions and between each chain end and a branch junction

3.68**bridge**

two-spoked member supporting the centre of the head of an *extruder* (3.187)

Note 1 to entry: See also *spider* (3.466).

3.69**brittleness temperature**

lowest temperature below which all of a *set* (3.440) of *test pieces* (3.517) fractures due to low-temperature embrittlement when tested under specified conditions

Note 1 to entry: ISO 812 contains a method for the determination of brittleness temperature.

3.70**buffing**

<recycling> particulate *vulcanized rubber* (3.541) obtained from abrading rubber articles, especially during tyre retreading operations

3.71**bulk density**

mass per unit volume of a material, including any *voids* (3.539) present

Note 1 to entry: The term is applicable to cellular materials as well as to particulate materials.

3.72

bumping

breathing

release of pressure on a mould for a very short time at an early stage in the process of *vulcanization* ([3.542](#)) to allow the escape of gas or vapour

3.73

butyl rubber

isobutylene rubber

isobutylene-isoprene rubber

isobutene-isoprene rubber

IIR

high damping, low permeability rubber made by the *copolymerization* ([3.115](#)) of isobutylene and a small amount of isoprene

Note 1 to entry: The isoprene content allows sulfur *vulcanization* ([3.542](#)).

3.74

calender

machine with two or more essentially parallel *rolls* ([3.415](#)), operating at selected surface speeds, *nips* ([3.224](#)) and temperatures, for such operations as *sheeting* ([3.446](#)), laminating, *skim coating* ([3.445](#)) (topping) and *friction coating* ([3.219](#)) of a product to a controlled thickness and/or controlled surface characteristics

3.75

carbon black

compounding ingredient ([3.106](#)) consisting essentially of more than 95 % elemental carbon in the form of near-spherical *particles* ([3.341](#)) with major diameters less than 1 µm, generally coalesced into aggregates

Note 1 to entry: Carbon black is produced by incomplete burning or thermal decomposition of hydrocarbons.

3.76

carbon black aggregate

discrete, rigid colloidal entity that is the smallest dispersible unit in a suspension

Note 1 to entry: It is composed of extensively coalesced *particles* ([3.341](#)).

[SOURCE: ISO 15825:2017, 3.1.1]

3.77

casting

process in which a fluid material is poured or otherwise introduced into a mould or on to a prepared surface and is allowed to solidify without the use of external pressure

3.78

cavity

<mould> space within a mould to be filled to form the moulded product

3.79

cell

<cellular material> single small cavity surrounded partially or completely by walls

3.80

cellular polymeric flexible material

soft material having many *voids* ([3.539](#)) or *cells* ([3.79](#)) (open, closed or both) dispersed throughout its mass, made of rubber, *polyurethane* ([3.371](#)) or another plastics material

3.81**cellular striation**

layer within a material containing *cells* (3.79) that differs greatly from the characteristic cell *structure* (3.493)

3.82**centrifuged latex**

rubber *particle* (3.341) emulsion, the rubber concentration of which has been increased by the removal of *serum* (3.439) by centrifugal force

3.83**chalking**

<industry> formation of a powdery residue on the surface of a rubber, resulting from surface degradation

3.84**chemical antiozonant**

compounding ingredient (3.106) that confers ozone resistance through a chemical reaction at the rubber surface

3.85**chemical bonding**

adhesion of rubber to metal, textile or plastics by applying a chemical admixture to the substrate before placing it in contact with the rubber; the bond being developed usually during or after *vulcanization* (3.542)

Note 1 to entry: See also *bonding agent* (3.63).

3.86**chip rubber**

<recycling> vulcanized pieces produced by a mechanical process

Note 1 to entry: Rubber chips are usually between 10 mm and 50 mm in size.

Note 2 to entry: See also *elongated fibre-like rubber particles* (3.170), *fine powdered rubber* (3.199), *granulated rubber* (3.237) and *ground vulcanized rubber* (3.241).

3.87**chloroprene rubber****polychloroprene****CR**

ageing and weathering-resistant polymer made by the polymerization of 2-chloro-1,3-butadiene

3.88**closed cell**

cell (3.79) totally enclosed by its walls and hence non-interconnecting with other cells

3.89**closed-cell cellular material**

solidified foam in which practically all the *voids* (3.539) are non-interconnecting

3.90**cloth mark**

impression left on rubber by a fabric

3.91**coagent**

compounding ingredient (3.106) used in low concentrations to increase the *crosslinking* (3.129) efficiency of certain *non-sulfur vulcanizing systems* (3.328) or to modify the properties achieved by such systems

Note 1 to entry: The term is usually identified with *additives* (3.1) used to modify *vulcanization* (3.542) by organic peroxides.

3.92

coagulant

coagulating agent

<rubber latex> substance used to cause *coagulation* ([3.94](#))

3.93

coagulant dipping

<rubber latex> dipping process in which the mould or *former* ([3.216](#)) is first immersed in a *coagulant* ([3.92](#)) solution, then withdrawn, dried and immersed in the compounded *latex* ([3.270](#))

3.94

coagulation

<rubber latex> irreversible agglomeration of *particles* ([3.341](#)) originally dispersed in a *rubber latex* ([3.425](#)), to form a continuous phase of the polymer and a dispersed phase of the *serum* ([3.439](#))

3.95

coated fabric

textile with an adherent layer or layers of rubber- and/or plastics-based material on one or both surfaces, resulting in a flexible product

3.96

cold flow

slow deformation under gravitational force, at or below room temperature

3.97

collapse

<cellular material> inadvertent densification of a cellular material during its manufacture, resulting from breakdown of its *cell* ([3.79](#)) *structure* ([3.493](#))

3.98

colour index

numerical grade for the hue of technically specified *natural rubber* ([3.319](#)) obtained by comparison with Lovibond colour standards

Note 1 to entry: ISO 4660 contains a method for the determination of the colour index.

3.99

colour staining

<thread and foam-backed fabric> undesired pick-up of colour by a thread or fabric

Note 1 to entry: Examples of colour staining are: the pick-up of such colour when immersed in water, dry cleaning solvent or similar liquids that contain *dyestuffs* ([3.159](#)) or colouring material not intended for colouring, or pick-up by direct contact with other dyed material from which colour is transferred by *bleeding* ([3.53](#)) or sublimation.

3.100

colourant

pigment ([3.356](#)) or *dyestuff* ([3.159](#)) *compounding ingredient* ([3.106](#)) for colouring rubber

3.101

colour-fastness on exposure to light

light fastness

resistance to colour changes due to exposure to light

Note 1 to entry: Colour-fastness is commonly evaluated by visual assessment (using standard reference colour standards) or by instrumental assessment.

3.102**combined sulfur**

sulfur remaining in a *vulcanizate* (3.541) after extraction by a prescribed method

Note 1 to entry: This sulfur is bound to organic constituents (organically combined sulfur, for example in *vulcanized rubber* (3.541) or *factice* (3.190)) or to inorganic constituents (inorganically combined sulfur, for example barium sulfate), or to both.

3.103**complex shear modulus**

G^*

ratio of the *shear stress* (3.445) to the *shear strain* (3.486), where each can be represented by a complex number

3.104**complex Young's modulus**

E^*

ratio of the normal stress to the normal *strain* (3.486), where each can be represented by a complex number

3.105**compound**

DEPRECATED: rubber

intimate mixture of a rubber or rubbers or other polymer-forming materials with all the ingredients necessary for the finished product

3.106**compounding ingredient**

substance added to a rubber or *rubber latex* (3.425) to form a *mix* (3.298)

3.107**COAN****oil absorption number of compressed sample**

value used to characterise the *structure* (3.493) of *carbon black* (3.75) after compression

Note 1 to entry: COAN is an indication of reinforcement of compounded rubber due to the carbon black structure. The method of test is contained in ISO 4656.

Note 2 to entry: See also *oil absorption number* (3.330).

3.108**compression moulding**

moulding process in which the *blank* (3.52) is placed directly in the *mould cavity* (3.305) and compressed to shape by closure of the mould

3.109**compression set**

deformation remaining after complete release of the force producing the compressive deformation

Note 1 to entry: For solid rubber, compression set, as determined under specified conditions, is generally expressed as a percentage of the original deflection or deformation.

Note 2 to entry: For cellular materials, compression set, as determined under specified conditions, is generally expressed as a percentage of the original thickness.

3.110**conditioning**

exposure of a *test piece* (3.517) or material to a controlled atmosphere or mechanical treatment before testing in order to improve the reproducibility of the test results

Note 1 to entry: For specific definitions, see *environmental conditioning* (3.175) and *mechanical conditioning* (3.287).

3.111

contact stain

<rubber> discoloration which occurs on the portion of the surface of an object directly in contact with a rubber

3.112

continuous vulcanization

process for vulcanizing rubber during continuous passage through specially designed energy transfer equipment

3.113

conventional sulfur vulcanizing system

<diene rubbers> general-purpose vulcanizing system using a relatively high amount of elemental sulfur as the *vulcanizing agent* (3.543) and producing at *optimum cure* (3.334) a *network* (3.322) in which the *combined sulfur* (3.102) exists predominantly in polysulfidic and disulfidic *crosslinks* (3.127) and in *main-chain modifications* (3.282)

3.114

copolymer

polymer derived from more than one species of *monomer* (3.301)

Note 1 to entry: In the rubber industry, the term is generally used to refer to a polymer derived from two monomers.

[SOURCE: IUPAC]

3.115

copolymerization

polymer formation from two or more *monomers* (3.301)

3.116

copper staining

discoloration of a rubber surface caused by contact with copper or a copper-containing material, caused by the reaction between copper and a dithiocarbamate *accelerator* (3.5)

3.117

cored cellular material

cellular material containing a multiplicity of holes (usually, but not necessarily, cylindrical in shape) moulded or *cut* (3.137) into the material in some pattern, normally perpendicular to the largest surface, and extending a part or all of the way through the thickness of the material

3.118

coupling agent

ingredient that is capable of bonding fillers and rubbers during processing

Note 1 to entry: The most commonly used are *silane* (3.449) or titanium *compounds* (3.105).

3.119

cracker

heavy-duty *mill* (3.295) having two deeply corrugated or pyramid-cut *rolls* (3.415) for breaking down a rubber or a *mix* (3.298), or for cutting rubber or a mix into pieces

3.120

crater

pit

pockmark

unintended shallow depression on the surface of a moulded article

3.121**crazing**

formation of a random pattern of shallow cracks on a rubber surface, usually due to degradation by light

Note 1 to entry: Unlike *ozone cracking* (3.338), crazing does not depend on the presence of a tensile *strain* (3.486) in the rubber.

3.122**creamed rubber latex**

latex (3.270), the rubber concentration of which has been increased by *creaming* (3.123) and removal of the separated *serum* (3.439)

Note 1 to entry: See also *creaming* (3.123).

3.123**creaming**

<rubber latex> reversible process consisting of gathering, by gravitational force, rubber *particles* (3.341) surrounded by *serum* (3.439) near the bottom or top of the *latex* (3.270)

Note 1 to entry: This is generally accomplished by adding a *creaming agent* (3.124).

3.124**creaming agent**

<rubber latex> substance added to *latex* (3.270) to increase the rate of *creaming* (3.123)

3.125**creep**

time-dependent increase in *strain* (3.486) resulting from an applied stress

3.126**cross-head**

T-head

T-shaped *extruder head* (3.188) which diverts the flow of rubber at right angles to the axis of the *screw* (3.435), for direct *extrusion* (3.189) around the core

3.127**crosslink**

chemical bond or atom(s) joining two rubber chains or two parts of the same rubber chain as a result of *vulcanization* (3.542)

Note 1 to entry: In a *vulcanizate* (3.541), trapped chain entanglements can act as physical *crosslinks* (3.127) and contribute to the *crosslink density* (3.128).

3.128**crosslink density**

number of *crosslinks* (3.127) per unit volume or unit mass of *vulcanizate* (3.541)

3.129**crosslinking**

insertion of *crosslinks* (3.127) between or within rubber chains to give a *network* (3.322) *structure* (3.493)

3.130**crown**

increased diameter at the centre of a *calender* (3.74) *roll* (3.415) to compensate for the deflection of the roll under pressure

[SOURCE: ISO 472:2013, 2.238]

3.131**crumb**

<raw material> *elastomer* (3.167) in particulate form

3.132

crumb rubber-vulcanized

recycled *vulcanized rubber* (3.541) granules made with a granulator and/or *cracker* (3.119) *mill* (3.295), optionally with the aid of cryogenics, to reduce the size of the particles

3.133

cryogenic size reduction

cryo-grinding

cryogenic grinding

process occurring at extremely low temperatures, which facilitates the fragmentation of *vulcanized rubber* (3.541) scrap into very small, smooth surfaced particles

3.134

cupping

dishing

existence of a concavity in the thickness direction of a *cut* (3.137) *test piece* (3.517), caused by compression under the cutter or *die* (3.148)

3.135

cure rate

rate at which a rubber *compound* (3.105) vulcanizes after having reached the point of incipient *vulcanization* (3.542)

3.136

curemeter

device that measures the progress of *vulcanization* (3.542) in a *test sample* (3.429) at the vulcanizing temperature

3.137

cut

slice made by a knife or cutter across a portion of the width of the band of rubber during *mill* (3.295) mixing to assist blending and *dispersion* (3.154)

3.138

cup lump

field coagula

films and lumps of rubber found in tapping cups

3.139

damping constant

c

component of an applied force which is in quadrature (90° out of phase) with the deformation, divided by the velocity of deformation

3.140

daylight

space between the working surfaces of adjacent *platens* (3.364) of a *platen press* (3.365)

3.141

deflashing

process of removing *flash* (3.204)

3.142

delayed-action accelerator

chemical that provides, at the *vulcanization* (3.542) temperature, a period of no significant *crosslinking* (3.129), followed by a period of rapid *crosslink* (3.127) formation

Note 1 to entry: This class of *accelerator* (3.5) ensures *scorch* (3.431) safety during processing and *vulcanization* (3.542).

3.143**delta Mooney value**

measure of the *processability* (3.390) of a rubber using a Mooney shearing-disc viscometer

Note 1 to entry: ISO 289-3 contains a method for the determination of the delta Mooney value.

3.144**depolymerization**

breakdown of a polymer to its *monomer(s)* (3.301) or to a polymer of lower relative molecular mass

3.145**desiccant**

compounding ingredient (3.106) used to absorb moisture present in a rubber *compound* (3.105) or *mix* (3.298) in order to reduce porosity in the final product

3.146**devulcanizate**

product of *devulcanization* (3.147)

Note 1 to entry: See also *reclaimed rubber* (3.396).

3.147**devulcanization**

process in which the chemical *crosslinks* (3.127) of *vulcanized rubber* (3.541) are destroyed

Note 1 to entry: Devulcanization is commonly used in the recycling of scrap vulcanized rubber. It is similar to reclaiming in that recycling can be brought about by thermal, mechanical or chemical means but favours *crosslink* (3.127) loss with minimal rubber polymer degradation.

3.148**die**

part of an *extruder* (3.187) through which material is forced, forming a profile of the *extrudate* (3.186)

3.149**die line**

longitudinally raised identification line formed deliberately on an *extrudate* (3.186)

3.150**die swell**

<extrudate> difference between the dimensions of the cross-section of an *extrudate* (3.186) and the corresponding dimensions of the *die* (3.148) orifice, usually quantified as the percentage increase in the cross-sectional area

3.151**diene rubber**

type of *elastomer* (3.167) having an unsaturated carbon main chain derived mostly from butadiene or a substituted butadiene

3.152**dipping**

<rubber latex> process in which a layer of rubber is deposited on a mould or *former* (3.216) as a result of immersion in a bath of compounded *latex* (3.270)

3.153**dispersing agent**

<rubber latex> surface-active substance used to facilitate the *dispersion* (3.154) of solid *compounding ingredients* (3.106) in an aqueous system

3.154**dispersion**

<act of> distribution of one or more ingredients into a rubber, a rubber blend or a continuum material, by the application of shearing forces, in order to confer optimum and uniform properties

3.155

dough

<rubber> paste-like mass of smooth texture, consisting of a rubber *mix* (3.298) and solvent, used for spreading

3.156

dry rubber content

<rubber latex> concentration of rubber in a *latex* (3.270) or *latex* (3.270) *compound* (3.105), usually expressed as a percentage by mass

3.157

durometer

instrument for measuring the indentation *hardness* (3.247) of rubber

3.158

dusting

chalking

<act of> application of a powder to a rubber surface, generally to prevent adhesion to another surface

3.159

dyestuff

soluble *compounding ingredient* (3.106) used to impart colour

3.160

dynamic vulcanization

process of intimate *melt mixing* (3.290) of a thermoplastic polymer and a suitably reactive rubbery polymer in the presence of a vulcanizing system to generate a *thermoplastic elastomer* (3.521) with a chemically crosslinked rubbery phase, resulting in properties closer to those of a conventionally *vulcanized rubber* (3.541) when compared to the same uncrosslinked composition

3.161

ebonite

DEPRECATED: hard rubber

hard material made by sulfur *vulcanization* (3.542) of rubber in which the *hardness* (3.247) is substantially obtained by the action of the sulfur by both a high level of *crosslinking* (3.129) and modification of the basic polyisoprene polymer *structure* (3.493)

Note 1 to entry: The hardness results from the increase in *glass transition* (3.231) temperature that occurs when a diene rubber is combined with a higher proportion of sulfur.

3.162

efficient vulcanizing system

EV system

<diene rubbers> *vulcanizing system* (3.544) making efficient use of sulfur as a *vulcanizing agent* (3.543) and producing at *optimum cure* (3.334) a *network* (3.322) containing predominantly thermally stable monosulfidic *crosslinks* (3.127)

Note 1 to entry: EV systems comprise a sulfur donor or a low concentration of elemental sulfur, or both, combined with a high concentration of *accelerator(s)* (3.5).

3.163

elastic

of or pertaining to elasticity

3.164

elastic shear modulus

G'

storage shear modulus

component of an applied *shear stress* (3.445) which is in phase with the *shear strain*, divided by the *strain* (3.486)

3.165**elastic Young's modulus** E'

storage Young's modulus

component of an applied normal stress which is in phase with the normal *strain* (3.486), divided by the strain

3.166**elasticity**

property of rapid *recovery* (3.398) of a material to its approximate original shape and dimensions after substantial deformation by a force and subsequent release of that force

3.167**elastomer**

macromolecular material which returns rapidly to approximately its initial dimensions and shape after substantial deformation by a weak stress and release of the stress

3.168**elastomer compatibility index**

ECI

simple one-line designation incorporating the details of the changes in volume, *hardness* (3.247), *tensile strength* (3.510) and *elongation at break* (3.171) which standard *test pieces* (3.517) of a test rubber undergo when immersed in a particular hydraulic fluid under specified test conditions

Note 1 to entry: ISO 6072 contains a method of test for ECI.

3.169**elastomeric**

pertaining to an *elastomer* (3.167), or having properties similar to those of an elastomer

3.170**elongated fibre-like rubber particle**

<recycling> particulate *vulcanized rubber* (3.541) with *particles* (3.341) having elongated fibre-like shapes

Note 1 to entry: The average particle length is more than twice the particle diameter, which itself is less than 5 mm.

Note 2 to entry: See also *chip rubber* (3.86), *fine powdered rubber* (3.199), *granulated rubber* (3.238), *ground vulcanized rubber* (3.241).

3.171**elongation at break**

ultimate elongation

per cent elongation (3.353) of a *test piece* (3.517) at rupture

3.172**elongation at yield**

tensile strain (3.486) at the first point on the stress-strain curve where some further increase in strain is not accompanied by an increase in stress

[SOURCE: ISO 37:2017, 3.9, modified — note 1 to entry has been removed.]

3.173**emulsifying agent**

<rubber latex> surface-active substance used to facilitate the suspension of an immiscible liquid *compounding ingredient* (3.106) in an aqueous system

3.174**emulsion polymerization**

process in which one or more *monomers* (3.301) are dispersed, with the aid of soaps and/or *surfactants* (3.500), to form a stable, colloidal, aqueous *dispersion* (3.154) and then reacted to yield a *latex* (3.270)

3.175

environmental conditioning

storage of a *test piece* (3.517) or material under specified conditions, such as temperature and humidity, for a specified time

3.176

ethylene-propylene-diene rubber

ethylene-propylene terpolymer

EPDM

DEPRECATED: EPT

sulfur-vulcanizable, heat and ozone-resistant rubber made by the *copolymerization* (3.115) of ethylene, propylene and a small amount of a diene *monomer* (3.301) which allows sulfur *vulcanization* (3.542)

3.177

ethylene-propylene rubber

EPM

DEPRECATED: EPR

heat and ozone-resistant rubber made by the *copolymerization* (3.115) of ethylene and propylene

3.178

evaluation procedure

specified method to characterize a type of rubber or compounding material or reaction product

3.179

evaporated rubber latex

rubber *particle* (3.341) emulsion, the rubber concentration of which has been increased by evaporation of some of the water

3.180

expanded rubber

cellular rubber, having *closed cells* (3.88), made from a solid rubber *compound* (3.105)

Note 1 to entry: See also *sponge rubber* (3.468) and *foam rubber* (3.212).

3.181

explosive decompression

internal rupture of a rubber article caused by the rapid reversal of pressure, causing dissolved gases in the rubber to escape quickly through the surface

3.182

extender

organic material used as a replacement for a portion of the rubber required in a *compound* (3.105)

3.183

extensometer

device for determining the *strain* (3.486) of a *test piece* (3.517) during tensile testing

3.184

extractable sulfur

sulfur in a rubber *compound* (3.105) or *vulcanizate* (3.541) that can be extracted by a specified solvent under specified conditions

3.185

extraction stain

<rubber> *stain* (3.477) which occurs on the surface of an object in contact with a liquid containing leached-out constituents of rubber

3.186

extrudate

product of an *extrusion* (3.189) process

3.187**extruder**

machine which, through the use of a *screw* (3.435) or a hydraulic ram, continuously shapes a material by forcing it through a *die* (3.148) or dies

3.188**extruder head**

part of an *extruder* (3.187) which houses the *die* (3.148) and die holder

3.189**extrusion**

continuous shaping of a material by passage through a *die* (3.148)

3.190**factice**

DEPRECATED: rubber substitute

solid *compounding ingredient* (3.106) produced by reacting unsaturated oils (vegetable, fish or synthetic esters) with sulfur or sulfur chloride, and used as a *processing aid* (3.391) or *extender* (3.182)

Note 1 to entry: The word "Factice" is a registered trademark of the American Cyanamid Co. in North America for their specific product which satisfies this definition.

3.191**factory scrap**

raw, compounded, vulcanized or partially *vulcanized rubber* (3.541) rejected or generated as waste during product manufacture and found unsuitable for further use unless recycled

3.192**fatigue breakdown**

deterioration of a *test piece* (3.517) or product resulting from cyclic deformation

Note 1 to entry: The rate of deterioration can be influenced by environmental factors, for example temperature, oxygen, ozone and reactive liquids.

3.193**fatigue life**

<dynamic> number of deformations required to produce a specified state of breakdown in a *test piece* (3.517) or product that is deformed under a prescribed *set* (3.440) of conditions

3.194**fibrous filler**

flexible *filler* (3.196) having a high length to width aspect ratio

3.195**field latex**

natural rubber (3.319) *latex* (3.425) with or without a *preservative* (3.381) and prior to concentration or any other processing

Note 1 to entry: The *preservative* (3.381) is added to maintain the original state of the *latex* (3.270) as it came from the tree.

3.196**filler**

solid *compounding ingredient* (3.106), in particulate form, which may be added in relatively large proportions to a rubber or *rubber latex* (3.425) for technical or economic purposes

3.197**fill factor****filling factor**

volume portion of the mixing chamber filled with the rubber *compound* (3.105), expressed as a percentage

3.198

final mixing

productive mixing stage during rubber mixing when the *vulcanizing agents* ([3.543](#)) are added

3.199

fine powdered rubber

<recycling> particulate *vulcanized rubber* ([3.541](#)) of small *particle* ([3.341](#)) size used as an *extender* ([3.182](#)) or *filler* ([3.196](#))

Note 1 to entry: It is composed of mainly non-spherical particles with a maximum particle size of 0,1 mm.

Note 2 to entry: See also *chip rubber* ([3.86](#)), *elongated fibre-like rubber particles* ([3.170](#)), *granulated rubber* ([3.237](#)) and *ground vulcanized rubber* ([3.241](#)).

3.200

fine

<carbon black> agglomerate, *pellet* ([3.347](#)) or pellet fragment which passes through a sieve of aperture size 125 µm under specified conditions

Note 1 to entry: ISO 1435 contains a method for the determination of the fine's content.

3.201

first-order transition

change of state, usually synonymous with crystallization or melting in a polymer

3.202

fissure

<cellular material> split or crack in a cellular material

3.203

flame retardant

compounding ingredient ([3.106](#)) added, or a treatment applied, to rubber in order to suppress or delay the appearance of a flame and/or reduce its propagation (spread) rate

Note 1 to entry: The use of flame retardants does not necessarily suppress fire.

3.204

flash

spew

excess material protruding from the surface of a moulded product at the mould junction

Note 1 to entry: See also *back-rind* ([3.39](#)) and *sprue* ([3.472](#) and [3.473](#)).

3.205

flash line

spew line

line on the surface of a moulded product at the junction of the mould parts

3.206

flex life

number of cycles required to produce a specified degree of failure in a *test piece* ([3.517](#)) that is flexed in a prescribed manner

3.207

flexometer

machine which subjects a *test piece* ([3.517](#)) to a cyclic deformation which may be in compression, tension or shear or any combination thereof, including bending motion

Note 1 to entry: In some countries, the term applies only to machines that measure the effect of temperature rise and/or *heat build-up* ([3.248](#)).

3.208**flocculant**

<rubber latex> substance which, when added to *latex* (3.270), causes *flocculation* (3.209)

3.209**flocculation**

<rubber latex> formation (sometimes reversible) of loosely coherent, partially agglomerated rubber, distributed in the liquid phase of a *latex* (3.270)

3.210**flow line**

<moulding> visible line in a moulding in the direction of, and caused by, flow

3.211**flow mark**

<moulding> mark or line on a moulded product, caused by imperfect fusion of flowing fronts

3.212**foam rubber**

cellular rubber usually composed mainly of interconnecting *cells* (3.79), normally made from liquid starting materials

Note 1 to entry: The term is also used commercially for certain blown products produced from solid materials, for example thermoplastic rubbers.

Note 2 to entry: See also *sponge rubber* (3.468), *expanded rubber* (3.180), *latex foam* (3.271) and *urethane foam* (3.536).

3.213**foam stabilizer**

<rubber latex> *compounding ingredient* (3.106) used in the preparation of *latex foam* (3.271) to stabilize the foamed *latex* (3.270) *compound* (3.105) during gelation, drying and *vulcanization* (3.542)

3.214**foaming agent**

<rubber latex> *compounding ingredient* (3.106) used to facilitate the formation of air bubbles in *latex* (3.270) during the production of *latex foam* (3.271)

3.215**foreign matter**

contamination

unintended material embedded in a product

3.216**former**

shaped object on which a *rubber product* (3.426) is produced by *dipping* (3.152)/building up or wrapping, and from which the product is subsequently removed

3.217**formulation**

list of *compounding ingredients* (3.106) and their proportions, used in the preparation of a *compound* (3.105)

3.218**free sulfur**

uncombined sulfur in a rubber *compound* (3.105) or *vulcanizate* (3.541)

Note 1 to entry: In practice, the methods for determination of free sulfur include elemental sulfur and can also include some coordinately bound reactive sulfur, such as that in thiuram disulfide and polysulfides.

3.219

friction coating

frictioning

process of applying a rubber coat to a textile by shearing action on a *calender* (3.74) so that the coating impregnates the textile

3.220

friction ratio

roll-speed ratio

ratio of the surface speeds of two adjacent *rolls* (3.415) of a *mill* (3.295)

3.221

frosting

formation of a matt, bloom-like appearance on a rubber surface exposed to air, resulting from the action of ozone

3.222

fumed silica

material composed of amorphous *particles* (3.341) obtained by pyrolysis of tetrachlorosilane

3.223

furnace carbon black

oil-furnace carbon black

type of *carbon black* (3.75) produced by the decomposition reaction of hydrocarbons when injected into a high-velocity stream of combustion gases

3.224

gas permeability

transmission of gas(es) through a material, governed by diffusion and sorption

3.225

gauge length

known distance between *bench marks* (3.48)

3.226

gel

<rubber latex> matrix of rubber *particles* (3.341), holding liquid, formed initially during the intentional *coagulation* (3.94) of *latex* (3.270)

3.227

gel rubber

portion of *raw rubber* (3.394) insoluble in a chosen solvent

Note 1 to entry: A type of polymer *gel* (3.226).

3.228

gelling

<rubber latex> process that forms a *gel* (3.226)

3.229

gelling agent

<rubber latex> substance used to cause *gelling* (3.228)

3.230

general-purpose rubber

non-oil resistant type produced in high volume

EXAMPLE *Natural rubber* (3.319), or styrene butadiene rubber.

3.231**glass transition****second-order transition**

reversible physical change in a material from a viscous or rubber state to a brittle, glassy state

Note 1 to entry: The mid-point of the temperature range over which this transition takes place is commonly termed the “glass transition temperature”.

3.232**Gough-Joule effect**

reversible property exhibited by *vulcanized rubber* (3.541) whereby it contracts when heated while it is under stress

Note 1 to entry: The *modulus* (3.300) of *elasticity* (3.166) increases with temperature if the rubber is heated under stress. Similarly, if rubber is heated when under constant *strain* (3.486), it will experience greater stress. The effect is not exhibited at low temperatures nor by most filled *compounds* (3.105).

3.233**graft copolymer**

graft polymer (3.234) derived from more than one species of *monomer* (3.301)

Note 1 to entry: See also *graft polymer* (3.233).

[SOURCE: IUPAC]

3.234**graft polymer**

polymer, the molecules of which have one or more species of *block* (3.55) connected to the main chain as side chains, these side chains having constitutional or configurational features different from the constitutional units comprising the main chain, exclusive of junction points

[SOURCE: IUPAC]

3.235**graft rubber**

polymer modified by a reaction which attaches a specific *monomer* (3.301) or oligomer to a polymer chain

3.236**grain**

uni-directional orientation of rubber molecules and/or *filler* (3.196) *particles* (3.341), resulting in anisotropy of the material

3.237**granulated rubber**

<raw material> particulate raw or compounded rubber produced by granulation

3.238**granulated rubber**

<vulcanizate> <recycling> particulate *vulcanized rubber* (3.541) of relatively large *particle* (3.341) size produced by granulation of scrap vulcanized rubber

Note 1 to entry: It is composed of mainly non-spherical particles between 1 mm and 10 mm in size.

Note 2 to entry: See also *chip rubber* (3.86), *elongated fibre-like particles* (3.170), *fine powdered rubber* (3.199) and *ground vulcanized rubber* (3.241).

3.239**green**

state of a *compound* (3.105) or product before *vulcanization* (3.542)

3.240

green strength

resistance of raw or *unvulcanized rubber* (3.534) *compound* (3.105) to tensile distortion or fracture, and therefore a measure of the ability of the rubber or rubber compound to resist distortion during processing and product fabrication

Note 1 to entry: ISO 9026 contains a method for the determination of the *green strength* (3.240) of *raw rubber* (3.394) or unvulcanized compounds.

3.241

ground vulcanized rubber

crumb

powdered rubber

<recycling> particulate *vulcanized rubber* (3.541) of medium *particle* (3.341) size used mainly as an *extender* (3.182) or *filler* (3.196)

Note 1 to entry: It is composed of mainly non-spherical particles between 0,1 mm and 1 mm in size.

Note 2 to entry: See also *chip rubber* (3.86), *elongated fibre-like particles* (3.170), *fine powdered rubber* (3.199) and *granulated rubber* (3.238).

3.242

guayule rubber

cis-polyisoprene extracted from the shrub *Parthenium argentatum*

3.243

gum compound

gum stock

rubber compound containing no more than the necessary amounts of ingredients required for *vulcanization* (3.542) and small amounts of other ingredients for processing, colouring and improving resistance to ageing

3.244

gum dipping

process of impregnating textiles with rubber by immersion in a rubber solution

3.245

gutta-percha

hard thermoplastic substance, largely consisting of *trans*-polyisoprene, obtained from trees of the *Sapotaceae* family

3.246

H pull test

method in which the adhesion between *vulcanized rubber* (3.541) and textile cord is assessed by measuring the force required to pull a single cord from vulcanized rubber, the force being applied along the longitudinal axis of the cord

Note 1 to entry: Two strips of rubber and the interconnecting cord form the *test piece* (3.517) which resembles the letter "H".

3.247

hardness

resistance to indentation

3.248

heat build-up

accumulation of thermal energy generated within a material as a result of *hysteresis* (3.254) that produces an increase in temperature

3.249**heat sensitizer**

<rubber latex> *gelling agent* (3.229) effective only at elevated temperatures

3.250**heat-sensitive dipping**

<rubber latex> *dipping* (3.152) process in which a mould or *former* (3.216) is immersed in a compounded *latex* (3.270) containing ingredients that cause the latex to *gel* (3.226) at an elevated temperature

3.251**heating loss**

<carbon black> percentage loss in mass when *carbon black* (3.75) is heated at a specified temperature to constant mass

Note 1 to entry: ISO 1126 contains a method for the determination of heating loss.

3.252**homopolymer**

polymer derived from one species of *monomer* (3.301)

[SOURCE: IUPAC]

3.253**hyperelasticity**

mathematical constitutive model used to describe the non-linear stress-*strain* (3.486) relationship of rubber

Note 1 to entry: Can be used in the finite element analysis for the modelling of a material response under specified conditions of deformation.

3.254**hysteresis**

phenomenon reflecting energy loss in a complete cycle of deformation and relaxation

3.255**hysteresis loss**

loss of mechanical energy usually manifested as a rise in temperature, in a complete cycle of deformation and relaxation

3.256**impact resistance**

resistance to fracture under shock force

3.257**inclusion**

material embedded in a product

3.258**individual pellet crush resistance**

<carbon black> force required to fracture or to crush a *pellet* (3.347) under specified conditions

Note 1 to entry: ISO 8942 contains a method for the determination of individual pellet crushing strength.

3.259**inert filler**

filler (3.196) having no reinforcing effect

3.260**inhibitor**

substance used to prevent or suppress a chemical reaction

3.261

injection moulding

process in which a rubber *compound* (3.105) is forced into a closed mould from a separate chamber, by a pressure which is independent of the mould clamping force

3.262

insert

part, made of metal or other material, which can be placed into a mould to form a particular shape of the moulded article

3.263

internal mixer

machine with temperature controls containing one or more rotors operating in a closed *cavity* (3.78) used to masticate and/or to incorporate and disperse *compounding ingredients* (3.106) into the rubber

3.264

international rubber hardness degrees

IRHD

measure of *hardness* (3.247), the magnitude of which is derived from the depth of penetration of a specified indenter into a *test piece* (3.517) under specified conditions

Note 1 to entry: The IRHD scale is such that 0 degrees represents a material showing no measurable resistance to indentation and 100 degrees represents a material showing no measurable indentation. The scale is described fully in ISO 48.

3.265

iodine adsorption number

<carbon black> number of grams of iodine adsorbed per kilogram of *carbon black* (3.75) under specified conditions

Note 1 to entry: The property is an indication of the surface area of a carbon black. ISO 1304 contains a method for the determination of the iodine adsorption number.

3.266

isotropic

having the same physical properties in all directions

3.267

knit mark

knit line

witness mark visible on the surface of a moulding where two flow fronts have joined but not intimately merged

3.268

knuckle

nodule or irregularity in a *natural rubber* (3.319) *compound* (3.105) which arise from the presence of *white spots* (3.550) in the polymer

3.269

KOH number

<rubber latex> number of grams of potassium hydroxide equivalent to the acid radicals combined with ammonia in *latex* (3.270) containing 100 g of *total solids* (3.529)

Note 1 to entry: ISO 127 contains a method for the determination of the KOH number.

3.270

latex

colloidal aqueous *dispersion* (3.154) of a polymeric material

3.271**latex foam**

foam made from *rubber latex* (3.425)

3.272**leaching**

<rubber latex> process in which products made from *latex* (3.270) are washed with water to remove water-soluble materials, hence improving clarity, preventing *blooming* (3.60) of hydrophilic materials, increasing electrical resistivity and reducing water absorption

3.273**limiting threshold strain**

<static ozone testing> tensile *strain* (3.486) below which the time required for the development of ozone cracks increases very markedly and becomes virtually infinite, under specified exposure conditions

Note 1 to entry: ISO 1431-1 contains a method for the determination of the limiting threshold strain.

3.274**linear polymer**

polymer in which *monomeric units* (3.302) are bound to each other in a chain having no branches

3.275**liquid curing medium****LCM**

salt bath

eutectic mixture of inorganic salts, the molten phase of which is used as a heating medium for the *continuous vulcanization* (3.112) of a *rubber compound* (3.105), usually following *extrusion* (3.189)

Note 1 to entry: Commonly used salts are sodium nitrite and potassium nitrite.

3.276**logarithmic decrement**

Λ

natural (Naperian) logarithm of the ratio between successive amplitudes of the same sign of a damped oscillation

3.277**loss angle**

δ

measure of the extent that the *strain* (3.486) lags behind the resultant of the in-phase stress and the out-of-phase stress in a uniform sinusoidal deformation, the out-of-phase stress being caused by the viscous element of the material properties

Note 1 to entry: The higher the *loss angle* (3.277), the greater the *hysteresis loss* (3.255).

3.278**loss shear modulus**

G''

component of an applied *shear stress* (3.445) which is in quadrature (90° out of phase) with the shear *strain* (3.486), divided by the strain

3.279**loss Young's modulus**

E''

component of an applied normal stress which is in quadrature (90° out of phase) with the normal *strain* (3.486), divided by the strain

3.280**lot**

definite quantity of material produced under uniform conditions

3.281

lot sample

representative portion drawn from a definite quantity of material produced under uniform conditions

3.282

main-chain modification

chemical change, other than *crosslinking* (3.129), introduced along the polymer chain as a result of *vulcanization* (3.542) and other reactions

3.283

marching modulus cure

marching cure

type of *vulcanization* (3.542) during which the *modulus* (3.300) does not reach a maximum value but continues to rise slowly, after a rapid rise, at the vulcanization temperature

3.284

masterbatch

mother stock

predispersion

well-dispersed mixture of rubber and one or more *compounding ingredients* (3.106) in known proportions for use as a raw material in the preparation of the final *mix* (3.298) or *compound* (3.105)

Note 1 to entry: The term is most commonly used for mixes of rubbers with *fillers* (3.196) and/or *extenders* (3.182) and certain other ingredients, but without a *vulcanizing system* (3.544). Masterbatches may be used to facilitate processing or enhance properties of the final product, or both.

3.285

mastication

process of irreversibly reducing the molecular mass of a rubber, in either the raw or the mixed state, by the action of mechanical work (shear) and atmospheric oxygen, sometimes assisted by *peptizers* (3.351) and heat

3.286

maturation

<rubber latex> controlled storage before further processing, which allows escape of air bubbles and partial *prevulcanization* (3.384) of the rubber *particles* (3.341)

3.287

mechanical conditioning

prescribed programme of deformation of a *test piece* (3.517) prior to testing

Note 1 to entry: See also *scrapping* (3.433).

3.288

mechanical fatigue limit

<deformation cycling> maximum repetitive *strain* (3.486) to which a *test piece* (3.517) or product can be subjected, in the absence of chemical attack, without markedly decreasing *fatigue life* (3.193)

3.289

mechanical stability

<rubber latex> resistance to clotting of *latex* (3.270) when subjected to mechanical shear under specified conditions

Note 1 to entry: ISO 35 contains a method for the determination of mechanical stability.

3.290**melt mixing**

production of a thermoplastic rubber blend in which the mixing of the rubber and plastic components is carried out at a temperature above the melting point of the thermoplastic material

Note 1 to entry: Melt mixing is a key part of *dynamic vulcanization* (3.160) for the production of *thermoplastic vulcanizates* (3.522). The process ensures a *fine* (3.200) phase morphology in which the *vulcanized rubber* (3.541) *particles* (3.341) are embedded in a matrix of the plastic material.

3.291**memory**

shape memory

ability of rubber to return to its original size and shape after deformation

3.292**micro-crystalline cellulose**

aligned cellulose polymers derived by acid hydrolysis (particle size 1-100 µm)

Note 1 to entry: Used as a *semi-reinforcing filler* (3.438).

3.293**microhardness**

hardness (3.247) measured with an instrument having a smaller indenter and applying a lower force than normal instruments, permitting measurements on *test pieces* (3.517) or thin sheets with dimensions too small to allow the use of normal instruments

Note 1 to entry: Microhardness refers to the instrument and procedure used and is not a property of the rubber.

3.294**migration stain**

<rubber> discoloration caused by rubber on any portion of the surface of an object not in direct contact with the rubber

3.295**mill**

two-roll mill

machine with two counter-rotating *rolls* (3.415), frequently heated or cooled, usually driven at different speeds, and having an adjustable *nip* (3.224) for *mastication* (3.285), mixing, blending, *warm-up* (3.545) or *sheeting* (3.446)

3.296**mineral filler**

compounding ingredient (3.106) of mineral origin

EXAMPLE Clays, carbonates and silicates.

3.297**mineral rubber**

compounding ingredient (3.106) derived from petroleum asphalt and used as a *tackifier* (3.504), *softener* (3.459) or *extender* (3.182)

Note 1 to entry: The term is a misnomer; mineral rubber is not a rubber.

3.298**mix**

mixture of rubber in any form with other *compounding ingredients* (3.106)

Note 1 to entry: The term can apply to an incomplete rubber *compound* (3.105).

3.299

mixer

machine which, through the action of mechanical work (shear), incorporates and disperses *compounding ingredients* (3.106) into rubber(s) to form a *mix* (3.298) or *compound* (3.105)

3.300

modulus

measure of stiffness under specified conditions of deformation

Note 1 to entry: The term should not be used in isolation and should be prefaced by the mode of deformation, e.g. compression modulus or *shear modulus* (3.443).

3.301

monomer

low-molecular-mass substance, the molecules of which are capable of reacting with like or unlike molecules to form a polymer

3.302

monomeric unit

unit contributed by a single *monomer* (3.301) molecule in a *polymerization* (3.370) process

3.303

Mooney scorch

measure of the incipient vulcanizing characteristics of a rubber *compound* (3.105), determined using a Mooney shearing-disc viscometer

Note 1 to entry: ISO 289-2 contains a method for the determination of prevulcanization characteristics.

3.304

Mooney viscosity

measure of the viscosity of a *raw rubber* (3.394) or rubber *compound* (3.105), determined using a Mooney shearing-disc viscometer

Note 1 to entry: ISO 289-1 contains a method for the determination of Mooney viscosity.

3.305

mould cavity

space within a closed mould in which rubber is shaped

3.306

mould fouling

build-up of deposits on the surface of a mould

3.307

mould mark

impression on the surface of an article resulting from its mould

3.308

mould register

accuracy of alignment between mould parts when the mould is closed

3.309

moulding

<process> process of shaping a material in a mould by applying pressure and, usually, heat

3.310

moulding

<product> moulded product

3.311**moulding cycle**

complete sequence of operations in a process required for the production of one *set* (3.440) of formed articles

3.312**moulding shrinkage**

difference in dimensions between a *moulding* (3.310) and the *mould cavity* (3.305) in which it was moulded, both the mould and moulding being at normal room temperature when measured

3.313**Mullins effect**

loss of stiffness and reduction in the *elastic* (3.163) *modulus* (3.300) after the first few loading cycles undergone by a rubber *sample* (3.429) or component in use or in a test

Note 1 to entry: See also *scragging* (3.433) and *mechanical conditioning* (3.287).

3.314**multicavity mould**

mould permitting the production of several products in a single cycle

3.315**multiplaten press****multidaylight press**

press (3.383) with floating *platens* (3.364) between the upper and lower platens, thus providing more than one space for *moulding* (3.309)

3.316**naphthenic oil**

hydrocarbon *process oil* (3.389) usually containing 30 % to 45 % by mass of naphthenic hydrocarbons

3.317**natural ageing**

ageing under service conditions

Note 1 to entry: Natural ageing occurs both outdoors and indoors, whereas the term *weathering* (3.547) applies only to outdoor exposure.

3.318**natural latex concentrate**

natural rubber (3.319) *latex* (3.270) containing ammonia and/or other *preservatives* (3.381), and which has been subjected to some process of concentration

3.319**natural rubber**

cis-1,4-polyisoprene obtained from the botanical source *Hevea brasiliensis*

Note 1 to entry: natural rubber is also made by other plant species.

3.320**necking**

localized reduction in cross-section which can occur in a material under *tensile stress* (3.511)

3.321**nerve**

elastic (3.163) resistance of a *raw rubber* (3.394) or an *unvulcanized rubber* (3.534) *mix* (3.298) to deformation

Note 1 to entry: Nerve usually affects calendered-sheet gauge, *extrudate* (3.186) dimensions and/or surface characteristics.

3.322

network

three-dimensional reticulate *structure* ([3.493](#)) formed by interchain or within-chain bonding of rubber molecules in combination with chain entanglements

3.323

nitrogen adsorption specific surface area

material surface area, measured using test equipment of nitrogen adsorption techniques

Note 1 to entry: The methods are specified in ISO 18852, ISO 4652 and ISO 5794-1.

Note 2 to entry: Examples of materials are carbon black, silica or zinc oxide.

3.324

nip

radial clearance between the *roll* ([3.415](#)) surfaces of a *mill* ([3.295](#)) or *calender* ([3.74](#)) on a line of centres

Note 1 to entry: Alternatively, the space between the rolls used for milling or calendering the material.

3.325

nominal mixer capacity

free volume available for the mixing process

3.326

non-productive mixing

stage during the mixing process of rubbers with *fillers* ([3.196](#)) and/or *extenders* ([3.182](#)) and certain other ingredients, but without a *vulcanizing system* ([3.544](#))

3.327

non-staining antiozonant

compounding ingredient ([3.106](#)) used mainly in non-black *compounds* ([3.105](#)) to retard, with minimum discolouration, deterioration caused by ozone

3.328

non-sulfur vulcanizing system

vulcanizing system ([3.544](#)) not requiring free or donated sulfur for *crosslinking* ([3.129](#))

3.329

off-register

mismatch

off-set

malformation of a moulded product caused by a lateral shift of one part of the mould relative to another part

3.330

oil absorption number

OAN

value used to characterise the *structure* ([3.493](#)) of *carbon black* ([3.75](#))

Note 1 to entry: The method of test is contained in ISO 4656.

Note 2 to entry: OAN may also be determined on silica following ISO 19246. The oil absorption number with DOA provides an indication of the void volume formed by the aggregates and agglomerates of the silica *filler* ([3.196](#)).

3.331

oil-extended rubber

grade of *raw rubber* ([3.394](#)) containing a relatively high proportion of *process oil* ([3.389](#))

Note 1 to entry: The proportion of oil usually exceeds 15 parts per 100 parts by mass of rubber polymer.

3.332**open cell**

cell (3.79) not totally enclosed by its walls and hence interconnecting with other cells or with the exterior

3.333**open-cell cellular material**

cellular material in which practically all the *cells* (3.79) are interconnecting

3.334**optimum cure**

condition of *vulcanization* (3.542) required to achieve an acceptable compromise among a number of desired *vulcanizate* (3.541) properties or the optimum value of a selected property

3.335**organic filler**

particulate material obtained from biological sources

3.336**oscillating-disc curemeter**

type of *curemeter* (3.136) in which the force applied to the rubber *compound* (3.105) is produced by an oscillating disc embedded in a test *sample* (3.429) which is contained under pressure in a sealed *cavity* (3.78)

3.337**overcure**

state of *vulcanization* (3.542) beyond the *optimum cure* (3.334)

Note 1 to entry: Overcure is generally caused by too long a time and/or too high a temperature of vulcanization and/or *post cure* (3.374), and/or a surplus of *vulcanizing agents* (3.543).

3.338**ozone cracking**

formation of *fissures* (3.202) on the surface of rubber under a tensile *strain* (3.486), resulting from the action of ozone

Note 1 to entry: Ozone cracks are perpendicular to the direction of the tensile strain, and usually occur in rubber having main-chain unsaturation.

3.339**pale crepe rubber**

natural rubber (3.319) sheet/blanket of light-yellow natural rubber manufactured by coagulating natural rubber *latex* (3.270) which is bleached, milled and dried at about 50 °C

3.340**paraffinic oil**

hydrocarbon *process oil* (3.389), most or all of which is composed of alkanes

3.341**particle**

<carbon black> smallest discernible spherical or nearly spherical unit which can exist separately

Note 1 to entry: Groups of particles are generally coalesced into *aggregates*.

3.342**particle rugosity index**

ratio of the contoured (real) surface area to the orthogonal area of the surface

3.343

particulate rubber

rubber, vulcanized or unvulcanized, that has been transformed into a collection of *particles* (3.341), with or without a coating of a *partitioning agent* (3.344) to prevent agglomeration during production, transportation or storage

3.344

partitioning agent

substance used in the production of *powdered rubber* (3.241) to keep *particles* (3.341) separated

3.345

parts per hundred rubber

pphr

phr

mass of *compounding ingredient* (3.106) added to one hundred mass units of *elastomer* (3.167)

Note 1 to entry: *Formulations* (3.217) for rubber *mixes* (3.298) are normally expressed in pphr.

3.346

Payne effect

phenomenon of dynamic modulus decreasing as *strain* (3.486) *amplitude* (3.487) increases, in rubber *compounds* (3.105) reinforced with *filler* (3.196) applicable at small strain amplitudes

3.347

pellet

<carbon black> agglomerate manufactured to facilitate handling and processing

3.348

pellet size distribution

<carbon black> percentage of *carbon black* (3.75) *pellets* (3.347) retained on each of a specified series of sieves arranged with progressively smaller openings

Note 1 to entry: ISO 8511 contains a method for the determination of pellet size distribution.

3.349

pelleted carbon black strength

mass strength

ability of *carbon black* (3.75) *pellets* (3.347) to cohere under specified conditions

Note 1 to entry: ASTM D1937 contains a method for the determination of the strength of carbon black pellets.

3.350

penetration stain

<rubber> discoloration which occurs on the outer or opposite surface of a material in contact with a rubber surface

Note 1 to entry: Note 1 to entry: A type of recovered *carbon black* (3.75).

3.351

peptizer

compounding ingredient (3.106) used in small proportions to accelerate by chemical action the *mastication* (3.285) of rubber under the influence of mechanical action or heat, or both

3.352

perish

breakdown and/or cracking of *rubber products* (3.426)

3.353

per cent elongation

elongation of a *test piece* (3.517) or specified portion thereof having a uniform cross-section, expressed as a percentage of the original length

3.354**permanent set**

irreversible deformation remaining in a rubber material after removal of the stress

3.355**peroxide cure**

crosslinking (3.129) of rubber using free radicals from organic peroxides, which results in direct covalent linkages between polymer chains

3.356**pigment**

insoluble *compounding ingredient* (3.106) used to impart colour

Note 1 to entry: The use of the term pigment as a substitute for compounding ingredient is discouraged.

3.357**pinhole**

hole of very small diameter in the surface of a material

Note 1 to entry: In the case of films, the hole usually penetrates through the entire thickness.

3.358**plasticity**

characteristic of *raw rubber* (3.394) or an *unvulcanized rubber* (3.534) *mix* (3.298) manifested by retention of deformation after removal of the deforming force

Note 1 to entry: High plasticity implies a substantial retention of deformation.

3.359**plasticity number**

measure of plasticity, based upon the height of a *test piece* (3.517) after being subjected to deformation under specified conditions of compressive force, time and temperature

3.360**plasticity retention index****PRI**

<natural rubber> ratio of the *plasticity number* (3.359) measured after air-oven ageing for 30 min at 140 °C to the plasticity number before oven ageing

Note 1 to entry: ISO 2930 contains a method for the determination of the plasticity retention index (PRI).

3.361**plasticizer**

compounding ingredient (3.106) used to enhance the flexibility of a rubber or product, especially at low temperature

3.362**plastimeter**

plastometer

instrument for measuring the plasticity of a *raw rubber* (3.394) or *mix* (3.298)

Note 1 to entry: Some commercial instruments called plastometers do not measure plasticity but measure the indentation produced in a product under a fixed load.

3.363**plateau cure**

flat cure

type of *vulcanization* (3.542) during which the *modulus* (3.300) of the *vulcanizate* (3.541) proceeds to a maximum and then remains essentially constant for a substantial period at the vulcanization temperature

3.364

platen

flat metal plate (or chest) which applies heat and pressure to one or more mould(s) in a *press* (3.383)

3.365

platen press

daylight press

press (3.383) having two or more superimposed heated *platens* (3.364) between which moulds are pressed

3.366

plucking

tearing out of isolated portions from a rubber surface during separation from a second surface

3.367

polyaddition

polyfunctional *monomers* (3.301) reacting by step-reaction *polymerization* (3.370), without the elimination of other products, to form large molecules

Note 1 to entry: For example, a di-isocyanate and a diol react to form a *polyurethane* (3.371), and a di-isocyanate and a diamine react to form a polyurea.

Note 2 to entry: See also *addition polymerization* (3.9).

3.368

polycyclic aromatic hydrocarbon

PAH

organic *compound* (3.105) consisting of two or more aromatic rings where certain carbon atoms are common to two or more rings

3.369

polymer

substance composed of molecules characterized by the multiple repetition of one or more species of atoms or groups of atoms (constitutional units) linked to each other in amounts sufficient to provide a *set* (3.440) of properties that do not vary markedly with the addition or removal of one or a few of the constitutional units

[SOURCE: IUPAC]

3.370

polymerization

process of converting a *monomer* (3.300) or a mixture of monomers into a *polymer* (3.369)

Note 1 to entry: For specific definitions, see *addition polymerization* (3.9), *emulsion polymerization* (3.174), *solution polymerization* (3.461), *stereospecific polymerization* (3.482) and *polyaddition* (3.367).

[SOURCE: IUPAC]

3.371

polyurethane

polymeric reaction product of a polyol and an isocyanate having two or more isocyanate groups which enable chain extension

Note 1 to entry: Liquid and solid millable types are available.

3.372

poromeric material

synthetic leather-like material that is permeable to air and water vapour and usually resistant to water penetration and *abrasion* (3.1)

3.373**post-consumer recycled content**
post-consumer material
PCR

material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose, including returns of material from the distribution chain

3.374**post cure**

use, following the primary *vulcanization* ([3.542](#)), of retained heat or a heat and/or radiation treatment either to complete the vulcanization or to enhance the level of one or more properties of a rubber

3.375**post-industrial recycled content**
pre-consumer material
PIR

material diverted from the waste stream during a manufacturing process, excluding reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it

3.376**pot life**

period of time during which a reacting liquid *thermosetting* ([3.524](#)) composition remains suitable for its intended application

3.377**pour density**

apparent mass per unit volume of bulk powder, *pellets* ([3.347](#)) or other discontinuous solid material

3.378**powdered rubber**

<raw material> particulate raw or compounded rubber

3.379**precipitated silica****precipitated hydrated silica**

material composed of amorphous *particles* ([3.341](#)) obtained from soluble silicates by precipitation from aqueous solution

3.380**precoagulum**

<rubber latex> coagulum resulting from partial inadvertent *coagulation* ([3.94](#)) of a *rubber latex* ([3.425](#))

3.381**preservative**

<rubber latex> substance added to uncompounded *latex* ([3.270](#)) before or after concentration to inhibit putrefaction and accompanying *coagulation* ([3.94](#))

3.382**preserved rubber latex**

latex ([3.270](#)) treated to inhibit putrefaction and accompanying *coagulation* ([3.94](#))

3.383**press**

equipment consisting of heated *platens* ([3.364](#)) which apply pressure to moulds

Note 1 to entry: See also *platen press* ([3.365](#)).

3.384

prevulcanization

precure

<rubber latex> process of curing compounded *latex* (3.270) so that it retains its dispersed-emulsion character

Note 1 to entry: Prevulcanized *latex* (3.270) needs only to be dried to form a coherent and stable product.

3.385

prevulcanization inhibitor

compounding ingredient (3.106) that increases the time during which there is no significant *crosslinking* (3.129) of a rubber *compound* (3.105) at processing and vulcanizing temperatures, but has a negligible effect on the *cure rate* (3.135) at the *vulcanization* (3.542) temperature

Note 1 to entry: A prevulcanization inhibitor differs from a *retarder* (3.411) in that it extends only the period before the onset of crosslinking, whereas many retarders suppress vulcanization reactions as a whole and so reduce the cure rate.

3.386

prevulcanized rubber latex

latex (3.270) in which the *particles* (3.341) have been partially or fully vulcanized

Note 1 to entry: Films and other products can be produced by simply drying such latex.

3.387

primary accelerator

principal chemical used to speed *vulcanization* (3.542)

3.388

primer

anchor coat that is applied on non-rubber parts to improve adhesion between the rubber *compound* (3.105) and non-rubber part

3.389

process oil

hydrocarbon oil derived from petroleum or other sources and used as an *extender* (3.182) or *processing aid* (3.391)

3.390

processability

relative ease with which raw or compounded rubbers can be handled in rubber-processing machinery

3.391

processing aid

compounding ingredient (3.106) which improves the *processability* (3.390) of a rubber *compound* (3.105) or *mix* (3.298)

3.392

proofing

<act of> process of coating a fabric with a suitable rubber *compound* (3.105) to impede penetration by a fluid, or to provide other special protective characteristics

3.393

pyrolytic carbon

particles (3.341), mainly composed of carbon, produced by the pyrolytic degradation of rubber

Note 1 to entry: A type of recovered *carbon black* (3.75).

3.394**raw rubber**

virgin rubber

natural or *synthetic rubber* (3.502), usually in bales or packages, forming the starting material for the manufacture of *rubber products* (3.426)

Note 1 to entry: It is normally free from *compounding ingredients* (3.106) but may also, for example, take the form of a *masterbatch* (3.284) with oil and/or *filler* (3.196).

Note 2 to entry: See also *oil-extended rubber* (3.331).

3.395**rebound**

ratio percent between the returned and the applied energy of a moving mass impacting a rubber *test piece* (3.517)

Note 1 to entry: See also *resilience* (3.408).

3.396**reclaimed rubber**

reclaim

recycled rubber (3.400) material produced by heat, mechanical or chemical treatment, or combination of some of these treatments, of used *vulcanized rubber* (3.541)

Note 1 to entry: See also *devulcanization* (3.147) and *recycled rubber* (3.400).

3.397**reclaiming agent**

material added during rubber reclaiming to accelerate and optimize the process

3.398**recovery**

degree to which a *rubber product* (3.426) returns to its normal dimensions after being deflected, distorted or otherwise deformed

3.399**recycled content**

portion of a *rubber product* (3.426)'s weight that is composed of materials that have been reworked

3.400**recycled rubber****recyclate rubber**

reusable rubber material derived from *scrap rubber* (3.434)

3.401**recycled vulcanized particulate rubber**

reusable *vulcanized rubber* (3.541) that has been processed to give *particles* (3.341) of different shapes, sizes and size distributions

Note 1 to entry: See also *chip rubber* (3.86), *elongated fibre-like rubber particles* (3.170), *fine powdered rubber* (3.199), *granulated rubber* (3.238) and *ground vulcanized rubber* (3.241).

3.402**refiner**

two-roll mill (3.295) with a high *friction ratio* (3.220), used for such operations as processing of *reclaimed rubber* (3.396), processing of slightly scorched *mixes* (3.298) and crushing of impurities

3.403**reinforcing agent**

compounding ingredient (3.106) used in rubber to increase resistance to mechanical force

3.404

reinforcing filler

particulate material, not basically involved in the *vulcanization* (3.542) process, that increases rubber stiffness and properties such as *tear strength* (3.508) and *abrasion resistance* (3.2)

3.405

relative volume loss

reduction in volume of a rubber *test piece* (3.517), compared to a standard piece, after being subjected to an *abrasion* (3.1) test

Note 1 to entry: ISO 4649 contains a method for the determination of relative volume loss using a rotating drum device.

3.406

release agent

mould lubricant

<moulding> substance applied to the inside surfaces of a mould, or added to a material to be moulded, to facilitate removal of the product from the mould

3.407

re-odorant

substance added to rubber to impart a special aroma

3.408

resilience

ratio of the energy output to the energy input in a rapid (or instantaneous) full *recovery* (3.398) of a deformed *test piece* (3.517)

3.409

resin

organic material, of indefinite and relatively high molecular mass, having a specific melting range

Note 1 to entry: Resins may be used as *softeners* (3.459), *tackifiers* (3.504), *processing aids* (3.391), *reinforcing agents* (3.403) and *vulcanizing agents* (3.543).

3.410

resin rubber

rubber *compound* (3.105) to which *resin* (3.409) has been added to increase *vulcanizate hardness* (3.247) without causing an undesirable increase in *mix* (3.298) viscosity which would inhibit flow during processing

Note 1 to entry: In many countries, the term applies to high styrene resin reinforced compounds used in footwear.

3.411

retarder

compounding ingredient (3.106) used to reduce the tendency of a rubber *compound* (3.105) to vulcanize prematurely

3.412

reversion

anaerobic deterioration of *vulcanizate* (3.541) *modulus* (3.300) and modulus-related properties on *overcure* (3.337), caused by a continued exposure to vulcanization temperatures

Note 1 to entry: Reversion is caused by a decrease in *crosslink* (3.127) density.

3.413

reverting cure

peaky cure

type of *vulcanization* (3.542) during which the *modulus* (3.300) of the *vulcanizate* (3.541) proceeds to a maximum and then decreases during an additional period at the vulcanization temperature

3.414**ribbed smoked sheet****RSS**

natural rubber (3.319) manufactured by coagulating *natural rubber latex* (3.425), followed sequentially by removing water by milling, passing through a *ribbed surface mill* (3.295), drying and smoking

Note 1 to entry: Visual grading is carried out in accordance with the "Green Book".

3.415**roll**

cylinder forming a major, rotating member of a *calender* (3.74) or *mill* (3.295)

3.416**room-temperature vulcanization****cold cure****RTV**

vulcanization (3.542) which takes place at or near room temperature

Note 1 to entry: This does not occur normally and requires the use of a special *vulcanizing system* (3.544).

3.417**root-mean-square strain**

square root of the mean value of the square of the *strain* (3.486) averaged over one cycle of deformation

Note 1 to entry: For a symmetrical sinusoidal strain, the root-mean-square strain equals the *strain amplitude* (3.487) divided by $\sqrt{2}$.

3.418**root-mean-square stress**

square root of the mean value of the square of the stress averaged over one cycle of deformation

Note 1 to entry: For a symmetrical sinusoidal stress, the root-mean-square stress equals the stress amplitude divided by $\sqrt{2}$.

3.419**rotorless curemeter**

type of *curemeter* (3.136) in which the force applied to the rubber *compound* (3.105) is produced by the oscillation of one of the two *dies* (3.148) forming the *cavity* (3.78) in which the test *sample* (3.429) is enclosed

3.420**rubber**

<in products> family of polymeric materials which are flexible and *elastic* (3.163)

Note 1 to entry: Rubber can be substantially deformed under stress but recovers quickly to near its original shape when the stress is removed. It is usually made from a mixture of materials (solid or liquid), and in most products the base *polymer* (3.369) is crosslinked by either chemical or physical links.

Note 2 to entry: For customs purposes, "rubber" is defined in Chapter 40 of the International Harmonized System as meaning "... products, whether or not vulcanized or hard *natural rubber* (3.319), *balata* (3.41), *gutta-percha* (3.245), guayule, chicle and similar natural gums, *synthetic rubber* (3.502), *factice* (3.187) derived from oils, and such substances reclaimed". See also 3.421.

3.421**rubber**

<raw material> natural or synthetic *elastic* (3.163) *polymer* (3.369) (elastomer) which forms the basis of the *compound* (3.105) used in many *rubber products* (3.426)

3.422**rubber bale**

block (3.55) of raw *rubber* (3.394) for trading or transportation

3.423

rubber chemical

compounding ingredient (3.106) used in relatively small amounts for *vulcanization* (3.542), protection against degradation, processing and to generate special properties

EXAMPLE Rubber chemicals include *accelerators* (3.5), antioxidants, antiozonants and *blowing agents* (3.61).

3.424

rubber hydrocarbon

elastomer (3.167) composed solely of carbon and hydrogen

Note 1 to entry: The term is used in chemical analysis and in rubber compounding as a measure of rubber content, exclusive of all other materials.

3.425

rubber latex

colloidal aqueous *dispersion* (3.154) of rubber *particles* (3.341)

3.426

rubber product

finished or semi-finished item designed for a specific use and manufactured from rubber or *rubber latex* (3.425) by compounding and/or *moulding* (3.310), *extrusion* (3.189), spreading, *dipping* (3.152) or other methods

Note 1 to entry: A rubber product may be made almost entirely of rubber, as for example a medical glove, or it may contain components (such as reinforcements) other than rubber, as for example in a *rubber-coated fabric* (3.95), a tyre, a steel-laminated *bridge* (3.68) bearing or a rubber hose fitted with a metal coupling. Rubber products are usually made by the rubber industry.

3.427

rubber process fumes

variety of volatile substances emitted from rubber *compounds* (3.105) into a workplace atmosphere as a result of industrial processing, the composition of which depends on the *formulation* (3.217) of the compounds concerned, the process technology in use, and the associated process parameters

Note 1 to entry: The term "rubber process generated volatile substances" has the same meaning and may be used in replacement of the term "rubber process generated fumes".

3.428

rubberize

impregnate and/or coat a substrate with a rubber *compound* (3.105)

3.429

sample

one or more items taken from a *lot* (3.280) and intended to provide information on the lot and possibly to serve as a basis for a decision on the lot or on the process which had produced it

3.430

Schwartz value

measure of the *modulus* (3.300) of *rubber latex* (3.425) thread after specified *mechanical conditioning* (3.287)

Note 1 to entry: ISO 2321 contains methods of test for rubber threads.

3.431

scorch

onset of vulcanization

Note 1 to entry: Often referred to as the onset of undesirable *vulcanization* (3.542) of a rubber *compound* (3.105).

3.432**scorch mark**

surface imperfection arising from premature *vulcanization* (3.542) during processing

3.433**scragging**

<act of> subjecting a product or *test piece* (3.517) to several mechanical-deformation cycles at stresses higher than those to be used in a subsequent dynamic test procedure

Note 1 to entry: See also *Mullins effect* (3.313) and *mechanical conditioning* (3.287).

3.434**scrap rubber**

raw, compounded, vulcanized or partially vulcanized rubber in the form of end-of-life *rubber products* (3.426) or *factory scrap* (3.191)

3.435**screw**

rotating member with one or more helical grooves, used to propel rubber along the barrel of an *extruder* (3.187)

3.436**secondary accelerator**

booster

accelerator (3.5) used in low concentrations with the *primary accelerator* (3.387) to optimize *cure rate* (3.135) and *vulcanize* (3.541) properties

3.437**semi-efficient vulcanizing system**

semi-EV system

<diene rubbers> *vulcanizing system* (3.544) having sulfur with or without a sulfur donor and an *accelerator* (3.5) concentration between those of a *conventional sulfur vulcanizing system* (3.113) and an *EV system* (3.162)

3.438**semi-reinforcing filler**

particulate material conferring properties between those of a *reinforcing filler* (3.404) and those of a diluent (non-reinforcing) *filler* (3.196)

Note 1 to entry: The *particle* (3.341) size, surface area, *structure* (3.493), polarity and reactivity, for example, are intermediate between those of diluents and reinforcing fillers.

3.439**serum**

<rubber latex> *dispersion* (3.154) medium for a *latex* (3.270)

3.440**set**

deformation remaining after complete release of the force producing a deformation

3.441**set after break**

set of a *test piece* (3.517) after stretching it to rupture

Note 1 to entry: See also *set* (3.440).

3.442**shape factor**

ratio of the area of one loaded surface to the combined area of those surfaces free to expand laterally when a rubber is under compression

3.443

shear modulus

quotient of the *shear stress* (3.445) divided by the corresponding *elastic* (3.163) *shear strain* (3.486)

3.444

shear strength

ability of a rubber to resist shear force when the rubber material is at breaking point

3.445

shear stress

external force acting on an object or surface exerting a vector component of stress parallel to the cross section; the stress tending to produce shear

3.446

sheeting

<act of> process of converting a rubber or rubber *mix* (3.298), rubber *dough* (3.155) or coagulated *latex* (3.270) into a form in which the thickness is small in proportion to the length

3.447

shelf ageing

ageing during the period of storage between production and ultimate use

3.448

shot

amount of material delivered to a mould assembly in one *moulding* (3.309) cycle

3.449

silane

silicon hydride (SiH_4)

Note 1 to entry: It is not *organosilane coupling agent* (3.450).

Note 2 to entry: In the rubber industry, silane is commonly used to mean organosilane.

3.450

silane coupling agent

organosilane coupling agent

substance used to chemically bind rubber and *silica fillers*

3.451

silanes

family of chemicals with a chemical formula of $\text{Si}_{(n)}\text{H}_{(2n+2)}$ or $\text{Si}_{(n)}\text{X}_{(2n+2)}$ where X may be any non-hydrogen atom or molecule

3.452

size reduction

processing of scrap *vulcanized rubber* (3.541) into smaller *particles* (3.341) by mechanical means at or above room temperature

3.453

silicone rubber

polysiloxane

heat resistant rubber having a main *polymer* (3.369) chain of alternating silicon and oxygen atoms

3.454

silver staining

discoloration of a silver surface in contact with a rubber containing *free sulfur* (3.218)

3.455**skim coating**

topping

<act of> process of applying a thin layer of rubber compound or *mix* (3.298) to a sheet material without producing significant shear forces between the rubber and the sheet

3.456**skim rubber**

rubber obtained from the dilute *latex* (3.270) separated during the concentration of *natural rubber* (3.319) *latex* (3.425)

3.457**skin**

<cellular material> relatively dense layer at the surface of a cellular material

3.458**sludge**

<rubber latex> sediment in uncompounded *rubber latex* (3.425)

3.459**softener**

compounding ingredient (3.106) used in small proportions to reduce the viscosity of an *unvulcanized rubber* (3.534) *mix* (3.298) or the *hardness* (3.247) of a *vulcanizate* (3.541)

3.460**sol rubber**

portion of rubber soluble in a chosen solvent

3.461**solution polymerization**

process in which one or more *monomers* (3.301) are dissolved in a common solvent system and reacted to yield a *polymer* (3.369)

3.462**solvent discolouration**

<carbon black> light transmittance, at a specified wavelength, of the filtrate obtained from a solvent extract of *carbon black* (3.75), compared to the transmittance of the pure solvent

Note 1 to entry: ISO 3858 contains a method for the determination of the light transmittance of a toluene extract.

3.463**spark test**

method, using high voltage probes, to determine the integrity of rubber liners fitted to metals

3.464**special-purpose rubber**

type of rubber having inherent attributes such as resistance to heat, ozone, *weathering* (3.547) and oils

3.465**speciality rubber**

type of rubber having exceptional properties that are used in demanding applications

3.466**spider**

member with three or more spokes supporting the centre of the head of an *extruder* (3.187)

Note 1 to entry: See also *bridge* (3.68).

3.467

spider line

radial line on a cross-section of an *extrudate* (3.186) corresponding to the spokes of a *spider* (3.466) or *bridge* (3.68)

3.468

sponge rubber

cellular rubber consisting predominantly of *open cells* (3.332) and usually made from a solid rubber compound

Note 1 to entry: See also *foam rubber* (3.212) and *expanded rubber* (3.180).

3.469

spreader

machine for distributing a rubber *dough* (3.155) or *latex* (3.270) on the surface of sheet material by means of a blade

3.470

spreader bar

doctor blade

spreader knife

blade used for spreading *dough* (3.155) or *latex* (3.270) smoothly and uniformly

3.471

spring constant

K

component of an applied force which is in phase with the deformation, divided by the deformation

3.472

sprue

<mould> primary entry channel along which rubber compound flows into a mould

3.473

sprue

<material> excess material protruding from the surface of a moulded product at the mould channels

Note 1 to entry: See also *flash* (3.204).

3.474

stabilized rubber latex

latex (3.270) treated to inhibit premature *coagulation* (3.94)

3.475

stabilizer

<rubber> substance present in or added to *raw rubber* (3.394) to maintain the properties at or near their initial values during drying, processing and storage

3.476

stabilizer

<rubber latex> substance incorporated in a *latex* (3.270) to prevent the agglomeration/*coagulation* (3.94) of rubber *particles* (3.341), especially during compounding and subsequent processing

Note 1 to entry: Stabilizers are present naturally in *natural rubber* (3.319) *latex* (3.425).

3.477

stain

undesired partial change in the article colour

3.478**standard compound**

rubber mixture prepared according to a prescribed *formulation* (3.217) using standard reference ingredients and mixing procedures

3.479**state of cure**

condition of a *vulcanizate* (3.541) during the course of *vulcanization* (3.542), measured in terms of its *structure* (3.493) or properties

3.480**steam pan****steam autoclave**

vessel pressurized by steam

Note 1 to entry: See also *autoclave* (3.37).

Note 2 to entry: Used to vulcanize preformed *rubber products* (3.426).

3.481**stearic acid**

<rubber industry> mixture of straight-chain saturated fatty acids composed substantially of $C_{17}H_{35}COOH$ and $C_{15}H_{31}COOH$

3.482**stereospecific polymerization**

polymerization (3.370) in which a *tactic polymer* (3.505) is formed

Note 1 to entry: See also *tactic polymer*.

[SOURCE: IUPAC]

3.483**stiffener**

compounding ingredient (3.106) used to increase the viscosity of an *unvulcanized rubber* (3.534) mix (3.298)

3.484**storage hardening**

increase in the viscosity of raw or *unvulcanized rubber* (3.534) during storage

Note 1 to entry: Storage hardening can occur in non-viscosity-stabilized *natural rubber* (3.319) and, unlike low-temperature crystallization, is not thermally reversible.

3.485**storage life****shelf life**

period of time after production during which a material or product kept under specified conditions retains its specified properties

3.486**strain**

fractional deformation in a body due to stress

3.487**strain amplitude**

ratio of the maximum deformation, measured from the point of mean deformation, to the free dimension of the unstrained *test piece* (3.517) (mean to peak on one side only)

3.488

strain-induced crystallization

stress-strain crystallization

ability of some *polymers* (3.369) to partially crystallise under stress or *strain* (3.486)

EXAMPLE *Natural rubber* (3.319) or *chloroprene rubber* (3.87).

3.489

strainer

extruder-type machine designed to force a rubber or rubber *mix* (3.298) through a sieve or sieves to remove solid extraneous material

3.490

stress

intensity, at a point in a body, of the internal forces (or components of force) that act on a given plane through the point

Note 1 to entry: Stress is expressed as a force per unit area. As used in tension, compression or shear tests, stress is calculated on the basis of the original dimensions of the appropriate cross-section of the *test piece* (3.517).

3.491

stress relaxation

time-dependent decrease in stress at a constant *strain* (3.486)

3.492

strike-through

penetration of rubber from a coated to an uncoated surface

3.493

structure

<carbon black> property or characteristic of a *carbon black aggregate* (3.76) that is manifested by the number of *particles* (3.341) per aggregate, the dimensions of the aggregate, the shape of the aggregate, and the tightness of particle interlocking, all taken together

3.494

styrene-butadiene rubber

SBR

general-purpose rubber (3.230) made by the *copolymerization* (3.115) of styrene and butadiene

3.495

sulfide sulfur

sulfur present in a *vulcanizate* (3.541) as inorganic or organic sulfide

3.496

sulfur cure

crosslinking (3.129) of *diene rubbers* (3.151) using elemental sulfur [in conjunction with e.g. *activators* (3.7), *accelerators* (3.5)] resulting in mainly oligo-sulfide linkages between *polymer* (3.369) chain

3.497

sulfur donor vulcanizing system

vulcanizing system (3.544) in which there is no elemental sulfur present and all sulfur used in the *vulcanization* (3.542) is provided by sulfur-containing materials

Note 1 to entry: In some countries, this is called a "sulfurless vulcanizing system".

3.498

sunlight checking

sunlight cracking

DEPRECATED: sun checking

crazing (3.121) or cracking of the surface of rubber due to exposure to sunlight

3.499**surface depression**

localized area on a *moulding* (3.310) which is slightly depressed due to *mould fouling* (3.306), air checks, laking, air entrapment or localised bond failure

3.500**surfactant**

surface-active agent added to a *latex* (3.270) or an aqueous *dispersion* (3.154) to assist stabilization

3.501**swelling**

increase in volume of a *test piece* (3.517) immersed in a liquid or exposed to a vapour

Note 1 to entry: The French term “gonflement” also includes what is usually described in English as “blowing”.

3.502**synthetic rubber**

elastomer (3.167) produced by non-biologically polymerizing one or more *monomers* (3.301)

3.503**tack**

<unvulcanized rubber> property that causes contacting surfaces of *unvulcanized rubber* (3.534) or *rubber compounds* (3.105) to adhere to each other

3.504**tackifier**

compounding ingredient (3.106) used to increase the *tack* (3.503) of *unvulcanized rubber* (3.534)

3.505**tactic polymer**

regular *polymer* (3.369) whose molecules can be described in terms of only one species of configurational repeating unit in a single sequential arrangement

[SOURCE: IUPAC]

3.506**tan delta****tan δ**

ratio of the viscous *modulus* (3.300) to the *elastic* (3.163) modulus

Note 1 to entry: It is a measure of the loss factor and thus of the energy lost by conversion into heat.

3.507**tear**

mechanical rupture in a rubber caused by a high stress concentration at a *cut* (3.137), sharp angle or localized deformation

3.508**tear strength**

maximum force required to *tear* (3.507) a specified *test piece* (3.517), the force acting substantially parallel to the major axis of the test piece

3.509**technically specified rubber****TSR**

type of *natural rubber* (3.319) processed by mechanically chopping *latex* (3.270) coagulum, which is then ground into small pieces, washed and dried with hot air

Note 1 to entry: Grading is carried out in accordance with the technical specifications.

Note 2 to entry: For further information, see ISO 2000.

3.510

tensile strength

maximum *tensile stress* (3.511) applied during stretching a *test piece* (3.517) to rupture

3.511

tensile stress

stress applied to stretch a *test piece* (3.517)

Note 1 to entry: It is calculated by dividing the applied force by the original cross-sectional area.

3.512

tensile stress at a given elongation

tensile modulus

stress required to stretch the significant portion of a *test piece* (3.517) to the given elongation

Note 1 to entry: See also *tensile stress* (3.511).

3.513

tensile stress at yield

maximum *tensile stress* (3.511) at the first point on the stress-strain curve where some further increase in *strain* (3.486) occurs without any increase in stress

3.514

tension fatigue

process whereby fracture is induced, through crack growth, in a *test piece* (3.517) or product subjected to repeated *tensile stresses* (3.511)

3.515

tension set

extension remaining after a *test piece* (3.517) has been stretched and allowed to retract freely

3.516

terpolymer

polymer derived from three different species of *monomer* (3.301)

[SOURCE: IUPAC]

3.517

test piece

piece of material of appropriate shape and size, prepared so that it is ready for use in a test

Note 1 to entry: The terms “test specimen” and “specimen” are also widely used to denote “test piece”.

3.518

thermal carbon black

type of *carbon black* (3.75) produced under controlled conditions by the thermal decomposition of hydrocarbon liquids or gases, or a combination thereof, in the absence of air or flames

3.519

thermal degradation

degradation due to increase in temperature resulting from external application, or internal generation, of heat

3.520

thermoelasticity

rubber-like *elasticity* (3.166) resulting from an increase in temperature

3.521**thermoplastic elastomer****TPE**

thermoplastic rubber

polymer or blend of polymers that has properties at its service temperature similar to those of *vulcanized rubber* ([3.541](#)), but can be processed and reprocessed at elevated temperature like thermoplastics

3.522**thermoplastic vulcanizate**

thermoplastic elastomer ([3.521](#)) with a chemically crosslinked rubbery phase, produced by *dynamic vulcanization* ([3.160](#))

3.523**thermoset**

polymer which, when cured by heat or other means, changes into a substantially infusible and insoluble product

3.524**thermosetting**, adj

capable of being irreversibly changed into a substantially insoluble material or product

3.525**thickener**

<rubber latex> *compounding ingredient* ([3.106](#)) used in small quantities to increase the viscosity of *latex* ([3.270](#)) or a *latex mix* ([3.298](#))

3.526**threshold strain**

<static ozone testing> highest tensile *strain* ([3.486](#)) at which a rubber can be exposed at a given temperature to air containing a given concentration of ozone without ozone cracks developing on it after a given exposed period

Note 1 to entry: ISO 1431-1 contains a method for the determination of threshold strain.

3.527**tinting strength**

<carbon black> capacity to reduce reflectance of a white paste in comparison to a reference black under specified conditions

Note 1 to entry: Usually expressed as a dimensionless ratio of the reflectance of a standard paste to that of a *sample* ([3.429](#)) paste, both pastes being prepared and tested under specified conditions. ISO 5435 contains a method for the determination of tinting strength.

3.528**total free volume**

volume of an *internal mixer* ([3.263](#)) chamber with the rotors in place

3.529**total solids**

residue after drying

proportion, expressed as a percentage by mass, of material not volatile under the conditions of test

Note 1 to entry: ISO 124 contains a method for the determination of the total solids content of a *latex* ([3.270](#)).

3.530**total sulfur**

all the sulfur present in a material irrespective of its chemical form or origin

Note 1 to entry: Measurement is usually carried out on sulfur-vulcanized rubber but can also be carried out on individual ingredients.

3.531

transfer moulding

moulding (3.309) process by which a rubber *compound* (3.105), in a chamber integral with the mould, is forced into one or more closed cavities by a pressure that is dependent on the mould clamping force

3.532

ultra-accelerator

highly active *accelerator* (3.5) for fast *vulcanization* (3.542), which is often used for low-temperature vulcanization

3.533

undercure

state of *vulcanization* (3.542) less than the *optimum cure* (3.334)

Note 1 to entry: Undercure is generally caused by too short a time and/or too low a temperature of vulcanization and/or *post cure* (3.374), and/or a deficiency of *vulcanizing agents* (3.543).

3.534

unvulcanized rubber

fully or partially compounded rubber before *vulcanization* (3.542)

3.535

upside down mixing

process in which bulk fillers and oils are added to an internal mixing before the rubber polymer

3.536

urethane foam

cellular material in which the matrix is a *polyurethane* (3.371)

3.537

UV absorber

compounding ingredient (3.106) which, through its ability to absorb ultra-violet radiation, retards the deterioration caused by the UV component of sunlight and/or other light sources

3.538

viscoelasticity

combination of viscous and *elastic* (3.163) deformation response in a material, with the relative contribution of each being dependent on time, temperature, stress and *strain* (3.486) rate

3.539

void

<cellular material> *cavity* (3.78) unintentionally formed in a cellular material and substantially larger than the characteristic individual *cells* (3.79)

3.540

volatile fatty acid number

VFA number

<rubber latex> number of grams of potassium hydroxide equivalent to the volatile fatty acids in 100 g of *total solids* (3.529)

Note 1 to entry: ISO 506 contains a method for the determination of volatile fatty acid number.

3.541

vulcanizate

vulcanized rubber

product of the *vulcanization* (3.542) of a rubber *compound* (3.105)

Note 1 to entry: Vulcanized rubber is a generic term, describing the type of rubber produced by vulcanization and used for classification purposes

3.542**vulcanization**

cure

process, usually involving heat, in which rubber, through a change in its chemical *structure* (3.493) [for example, *crosslinking* (3.129)], is converted to a condition in which the *elastic* (3.163) properties are conferred or re-established or improved or extended over a greater range of temperatures

Note 1 to entry: In some cases, the process is carried to a point where the substance becomes rigid, e.g. *ebonite* (3.161).

3.543**vulcanizing agent**

curative

curing agent

compounding ingredient (3.106) that produces *crosslinking* (3.129) in rubber

3.544**vulcanizing system**

combination of *vulcanizing agent* (3.543) and, as required, *accelerators* (3.5), *activators* (3.7), *retarders* (3.411), used to produce the desired *vulcanization* (3.542) characteristics and *vulcanizate* (3.541) properties

3.545**warm-up**

<processing> reduction in stiffness of a rubber or rubber *mix* (3.298) by mechanical work (shear) and heat to render it more suitable for further processing

Note 1 to entry: This operation is intended to proceed in such a fashion that a minimum change in molecular mass occurs.

3.546**water vapour transmission rate**

mass of water vapour passing through unit area of opposite faces of a *test piece* (3.517) during a given time, under a constant vapour pressure differential

Note 1 to entry: ISO 15105-1 and ISO 15105-2 contain methods for the determination of water vapour transmission rate.

3.547**weathering**

<effect of> combined detrimental influences of the outdoor environment including e.g. sunlight, ozone, oxygen, humidity, temperature on a material

3.548**webbing**

<rubber latex> thin, wet film formed between a *dipping* (3.152) *former* (3.216) and the surface of a *latex* (3.270) compound while the former is being withdrawn

3.549**wetting agent**

<rubber latex> *compounding ingredient* (3.106) used to reduce the surface tension of a *latex* (3.270) *mix* (3.298) and thereby facilitate spreading and impregnation of a surface by the latex mix

3.550**white spots**

wet spots

white localized patches of high moisture content in *raw rubber* (3.394)

Note 1 to entry: White spots tend to resist breakdown on *mastication* (3.285) and tend not to take up *carbon black* (3.75) as readily as does the dry matrix (rubber) on mixing.

Note 2 to entry: See also *knuckle* (3.268).