

Glossary of Rubber and Polymer Terms and Abbreviations

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A

Accelerator - A compounding material used with a vulcanizing agent to increase the speed of vulcanization.

ACM – Polyacrylate Rubber

AEM – Ethylene Acrylate

Adhesion - Sticking to a surface

Alternative Fuels - Includes fuels that contain 85% or more of alcohol, natural gas, propane, coal-derived liquids, hydrogen, electricity, biodiesel, fuels derived from biological materials.

AMS - Aerospace Material Specification

ANSI – American National Standards Institute

ASTM - American Society for Testing of Materials

B

Backrinding - A defect on the surface of a molded part which appears as a crack in the surface at the mold parting line.

Biodiesel- A fuel or mixture of fuels that is derived in whole or part from agricultural products that is suitable for diesel engines.

Biofuel- Renewable fuel derived from biomass.

Bisphenol AF- (BAF) A crosslinker for fluoroelastomers.

Bonding Agents- Substances used to promote the bonding of rubber to other materials such as metals.

BR – Polybutadiene rubber

Brittle Point – The low temperatures at which a rubber sample breaks when subjected to a sharp blow.

C

Capillary Rheometer- An instrument for measuring the shear flow properties of polymer melts. The data obtained are usually presented as graphs of shear stress or viscosity against shear rate at a constant temperature.

CARB - California Air Resources Board.

CE10 - 90% Reference Fuel FC and 10% Ethanol

CE85 - 15% Reference Fuel C and 85% Ethanol

CM15 - 85% Reference Fuel C and 15% Methanol

Compression Stress Relaxation (CSR) - The measurement of a material's ability to be compressed and maintain the resultant sealing force over a range of environmental conditions.

Compression Set - The residual deformation of a material after removal of the compressive stress.

Copolymer - Polymer formed of two or more monomers (Dipolymer)

CR – Polychloroprene rubber

CPI - Chemical Process Industry.

Cross-linking – The process of forming chemical bonds between polymer chains.

Cure Density – Crosslink density of the a polymer structure.

CSM – Chlorosulfonated polyethylene rubber

Cure Site Monomer (CSM) - Monomer that permits cross-linking through radical cure systems (peroxides). The CSM typically contains a halogen in peroxide cure FKMs.

Curing Agent - Chemical that causes cross-linking to occur.

D

DIN – German Standardization organization

Dipolymer- Polymer formed of two monomers, copolymer.

DSC - Differential scanning calorimeter, an analytical instrument used to measure melt temperature, onset of thermal decay, and other thermal data.

Durometer - An instrument for measuring the hardness of rubber and plastics. “A” Durometer is used for flexible materials the “D” for rigid materials.

Durometer Hardness - An arbitrary numbering scale that indicates the resistance to indentation of the indenter point of the Durometer instrument. Higher values indicate harder materials.

E

ECO – Rubber made from a copolymer of epichlorohydrin and ethylene oxide

Elastomer - A polymeric material which, at room temperature, is capable of recovering substantially in shape and size after removal of a deforming force. This generally refers to a synthetic polymer as opposed to rubber, which preferably indicates the natural product.

Elongation- Extension produced by tensile stress, usually expressed as a percent of original unit length.

Elongation, Ultimate- The elongation at time of break, Elongation at Break, EB.

EP, EDPM – Ethylene propylene (diene monomer) rubber

ESCR - Environmental stress crack resistance

ETFE - A polymer of tetrafluoroethylene and ethylene.

EURO V - European regulations for motorized vehicle emissions; V refers to the fifth stage.

EVA - Copolymer of vinyl acetate and ethylene.

Extrusion - Process to force rubbers or thermoplastics through an orifice, which is often shaped to the geometry of the desired product.

F

FAMEs - Fatty acid methyl esters, a form of biofuel.

FDA - United States Food and Drug Administration.

FEP - A polymer of tetrafluoroethylene and hexafluoropropylene.

FFKM - ASTM D 1418 designation for perfluoroelastomer. [Perlast](#) is a well known brand name for FFKM.

Filler - A solid compounding material, usually in finely divided form, which may be added in relatively large proportions to a polymer for technical and /or economical reasons.

Filler Content- Amount of filler(s) in a formulation (generally expressed in phr = parts per hundred parts of rubber).

FKM – ASTM D1418 designation for fluoroelastomers.

Flash- The excess material protruding from the surface of a molded article at the mold junctions.

Flex Fatigue Resistance - Endurance testing of rubber parts under dynamic stress.

Flowline - A defect in the surface of a molded part where the elastomer shows the witness of two flowing fronts that have not completely filled. Also known as a knitline.

Fluorine Content - Weight percentage of fluorine atoms in the a fluorinated polymer.

Fluoroelastomer - Elastomeric polymer consisting of fluorine containing monomers.

Fluoroplastic - Specialty plastic that contains significant amounts of fluorinated repetition units so that the characteristics of the material are impacted by the fluorinated repetition units.

Fluorothermoplastic - Fluoroplastic that can be molten repeatedly and that can be processed by conventional melt-processing techniques such as extrusion and injection molding,

FMQ – Fluorosilicone Rubber, fluoro methyl silicone rubber

FPM - European abbreviation for fluoroelastomers; same as FKM.

FSA – Fluid Sealing Association

Fuel C- 50/50 mixture by volume of Toluene and Isooctane

FVMQ – Fluorosilicone, fluoro vinyl methyl silicone rubber

G

Gasket- Deformable material clamped between essentially stationary faces to prevent the passage of matter through an opening or joint.

Glass Transition Point - Temperature at which a material loses its glasslike properties and becomes a semi-liquid. May be referenced as T_g.

H

Hardness- The resistance to indentation as measured under specified conditions (also see durometer hardness).

HDPE - High density polyethylene

Heat Aging - When specimens of vulcanized rubber are given accelerated aging in air or oxygen at elevated temperatures and in some cases, pressure for specified periods of time.

HFP - Hexafluoropropylene.

HK Tables - Fluoroelastomer classification system defined in SAE J200 / ASTM D2000.

HMW-HDPE - High molecular weight - high density polyethylene

HNBR – Hydrogenated nitrile rubber

I

ID- Inner diameter; used to express the size of an o-ring with the cross section.

IIR – butyle rubber; copolymer of isobutylene and isoprene

IR – Isoprene Rubber

IHRD – International rubber hardness degrees

ISO - International Organization of Standardization

K

Knit-line - A defect in the surface of a molded part where the elastomer shows the witness of two flowing fronts that have not completely filled.

L

LDPE - Low-density polyethylene

LEV - Low emission vehicle

LLDPE - Linear low density polyethylene.

Low Temperature Flexibility - The ability of a rubber product to be flexed, bent or bowed at specified temperatures without loss of serviceability.

M

Masterbatch - Homogeneous mixture of rubber and one or more materials in known proportions for use as a raw material in the preparation of the final compounds.

MB - Masterbatch

MH- Maximum torque on the cure curve.

MI- Melt index.

MIL (STD) – Military specification (standard)

Mill – Rubber mixing machine with two counter rotating rolls used for breakdown mastication, mixing or sheeting of rubber.

Mixer, Internal – Rubber mixing machine with a closed cavity in which a specially shaped rotor(s) that masticate the rubber and incorporate and disperse compounding materials into the rubber.

ML - Minimum torque on the rheometer cure curve.

MLLDPE - Metallocene linear low density polyethylene.

Mold Fouling- Chemicals extracted from rubber on the mold or layers of rubber baked to the mold.

Mold Release Agent- Substance applied to the surfaces of the mold or added to a material to be molded, to facilitate removal of the product from the mold.

Mold Shrinkage - The difference in dimensions between a molded part and the mold cavity in which it was molded caused by differences thermal expansion of the polymer and metal mold.

Mold Temperature- Temperature of the mold during the curing process.

Molecular Weight- The weight of a molecule as a sum of the atoms. Length of a polymer chain.

Monomer - Low molecular weight molecule capable of reacting with like or unlike molecules to form a polymer.

Mooney Scorch - A procedure for determining the cure characteristics of a compound using a mooney viscometer, generally at specified elevated temperatures. The values versus time are recorded or plotted and the time values reported when the viscosity values have increased 5 and 30 points above the minimum.

Mooney Viscosity- Measure of the viscosity of a rubber or rubber compound determined in a mooney shearing disc viscometer.

M-PE (also mLLDPE, m-LLDPE) - Metallocene catalyzed polyethylene.

MW- Molecular weight

N

NBR – Nitrile Butadiene Rubber, polymer of acrylonitrile and butadiene

NR – Natural Rubber

NSF – National Sanitation Foundation

O

OAT Coolant - Organic acid technology (long life) coolant. OAT coolants are typically used in diesel engine cooling systems.

Oil Resistance - The ability of an elastomer to withstand swelling and deterioration by a specified oily liquid for a specified time and temperature.

O-Ring - Product of precise dimensions molded in one piece to the configuration of a torus with a circular cross section, suitable for use as a seal in a machined groove for static or dynamic service.

P

PA - Polymer additive.

PE- Polyethylene.

Perfluoroelastomer - Perfluorinated rubber of the polymethylene type having all fluoro, perfluoroalkyl, or perfluoroalkoxy substituent groups on the polymer chain as defined by ASTM D1418. [Perlast](#) is a well known brand of perfluoroelastomer.

PEG - Polyethylene glycol.

Permeability- The permeation rate divided by the pressure gradient of the gas or vapor.

Permeation Rate - The flow rate of a gas or a vapor, under specified conditions, through a prescribed area of a solid body, divided by that area.

Peroxide - A compound containing a bivalent —O—O— group in the molecule. They are strong oxidizing agents and are very reactive (examples: benzoyl peroxide, dicumyl peroxide). Used in polymerization reactions and for cross-linking agents.

PFA - A polymer of tetrafluoroethylene and perfluorovinylether.

PMVE - Perfluoromethyl vinyl ether.

Polymer - Molecules characterized by the repetition of one or more types of monomeric units.

Polyolefins - Class of polymers made by polymerizing relatively simple olefins, including ethylene, propylene, butenes, isoprenes, and pentenes.

Post Cure- Heat treatment to which a cured or partially cured thermosetting plastic or rubber composition is subjected to increase the state of cure or enhance the level of one or more properties.

PP - Polypropylene.

PPM - Parts per Million

Press Cure - Vulcanization of rubber in a press operated by hydraulic pressure. The mold is placed between heated plates.

Primer- Coating applied to the surface of a material, prior to application of an adhesive to improve the performance of the adhesive bond.

Processability- The relative ease with which raw or compounded rubber can be handled in rubber machinery.

PS - Polystyrene.

PTFE - Polytetrafluoroethylene.

PVDF - A polymer of vinylidene fluoride.

PZEV- Partial zero emission vehicle.

R

Raw Gum- Base material for rubber compounds.

RFC- Reference Fuel C; a mixture of 50% Toluene and 50% IsoOctane.

Rheometer- Analytical testing device that measures the rheological properties of elastomeric compounds.

Rheovulcameter- Measuring device to measure the rheological properties of elastomeric compounds. Oscillating Disk Rheometer (ODR), Moving Die Rheometer (MDR)

RME- Rapeseed methyl ester, a type of biodiesel.

S

SAE - Society of Automotive Engineers

SBR – Styrene butadiene rubber

Scorch - Premature vulcanization of a rubber compound

SEM - Scanning electron microscope.

Shaft Seal – Rubber article used to seal rotating shafts.

SHED - Sealed housing for emission detection; test to measure evaporative emissions of automotive fuel.

Shrinkage - Contraction of a molded rubber product on cooling from vulcanization temperature.

SME - Soybean methyl ester; a type of biodiesel

SORE - Small off-road engine or equipment

Strain- Deformation of an elastomer resulting from a stress

Stress- Force per unit of original cross sectional area that is applied to a part or specimen

Stress Relaxation- The time dependent decrease in stress for a specimen at constant strain.

SULEV- Super ultra low emission vehicle

T

T'50 - Time to 50% cure of a rubber compound. Can be Measure by an ODR or MDR

T'90 - Time to 90% cure of a rubber compound. Can be measured by an ODR or MDR

Temperature Retraction (TR) Test- A test method for evaluating the low temperature characteristics of a vulcanized part by measuring the temperature at which retraction over the range of 10% to 70% of original elongation occurs. The specimen is stretched at room temperature, cooled to very low temperature, released and warmed at a uniform rate.

Tensile Strength- Maximum tensile stress applied during stretching of a specimen to break.

Terpolymer - Polymer formed of three monomer species.

TFE- Tetrafluoroethylene.

Tg- Glass transition temperature

TGA- Thermalgravimetric analysis

THV - A polymer of tetrafluoroethylene, hexafluoropropylene and vinylidene fluoride.

Thermogravimetric Analysis – TGA; An analytical test procedure used to determine the thermal stability or composition of a material. Two modes are possible: determining the change of weight of a specimen while changing temperature at a given rate, or the change of weight of a specimen with time at a fixed temperature.

Thermoplastics - Resins or plastic compounds which, in their final state as finished articles, are capable of being repeatedly softened by an increase of temperature and hardened by a decrease of temperature.

TR-10 - Temperature of Retraction- 10%, Measure of cold temperature elasticity of vulcanized rubber articles.

Ts2- Time to 2 point rise from minimum in minutes; Measured by ORD or MDR.

TSE - Twin screw extruder

U

UW – Underwriters Laboratory

V

VdF - Vinylidene fluoride; VF2

VF2 - Vinylidene fluoride; VdF

Viscosity - The measure of the resistance of a fluid to flow (either through a specific orifice or in a rotational viscometer). The absolute unit of viscosity measurement is poise. Mooney Units are used for measuring the viscosity of rubber.

VLLDPE - Very linear low density polyethylene

VMQ – Vinyl methyl silicone rubber

Volume Swell- Percentage increase in volume attained by immersing a vulcanized sample of rubber in a specific substance. Volume swell is used to determine the resistance of rubber to chemicals as well as to measure the cross-link density.

VOME - Vegetable oil methyl ester; a term for biodiesel

W

Weathering- Testing of plastics, textiles and coatings for resistance to atmospheric influences through outdoor or indoor testing with appropriate equipment.

X

XNBR – Carboxylated nitrile rubber

XRF - X-ray fluorescence spectroscopy

Z

ZEV - Zero emission vehicle