

Polymer Terminology

Electrical

ARC RESISTANCE - The time required for an arc to establish a conductive path in a material. (MIL-M-24041)

BREAKDOWN VOLTAGE - The voltage required, under specific conditions, to cause the failure of an insulating material. See Dielectric Strength.

CONDUCTANCE - The reciprocal of resistance. It is the ratio of current passing through a material to the potential difference of its end. Typically values of 10^3 or less are conductive, 10^5 to 10^7 are statically dissipative and 10^8 or higher are dielectric.

CONDUCTIVITY - Reciprocal of volume resistivity. Conductance of a unit cube of any material.

CORONA - A luminous discharge due to ionization of the gas surrounding a conductor around which exists a voltage gradient exceeding a certain critical value. A type of discharge-sometimes visible-in the dielectric of an insulation system caused by an electric field and characterized by the rapid development of an ionized channel which does not completely bridge the electrode. May be continuous or intermittent. Not a material property, but related to the system, including electrodes.

CORONA RESISTANCE - The time that insulation will withstand a specified level field-intensified ionization that does not result in the immediate complete breakdown of the insulation. (Higher values are better.)

DIELECTRIC STRENGTH - The voltage which an insulating material can withstand before breakdown occurs, usually expressed as a voltage gradient (such as volts per mil). (Higher values are better.) (ASTM D149) (Higher values are better.)

DIELECTRIC CONSTANT - The ratio of the capacitance of an assembly of two electrodes separated solely by a dielectric material to its capacitance when the electrodes are separated solely by air (ASTM D150-59T). (Lower values are better.)

DIELECTRIC – An insulating or non-conducting material. In radio-frequency preheating, dielectric may refer specifically to the material which is being heated.

DISSIPATION FACTOR - The ratio of its parallel reactance to its parallel resistance. This is a desirable property in electrical insulations for high-frequency applications because it minimizes the waste of electrical energy as heat. (ASTM D150) (Lower values are better.)

ENCAPSULATING - Enclosing an electrical device in liquid polymer.

FLAME RETARDANCE - The ability of a material to self-extinguish a flame once the flame has been removed. UL 94 is a common flame rating requirement.

INSULATION RESISTANCE - The electrical resistance between two conductors separated only by an insulating material. (The higher the number the better the insulator.)

OPERATING TEMPERATURE RANGE - The temperature range at which a material will not thermally degrade. Physical and electrical properties will vary across the operating temperature range.

POTTING - Filling a case or enclosure containing an electronic component.

POWER FACTOR - In an insulating material, the ratio of total power loss (watts) in the material to the product of voltage and current in a capacitor in which that material is a dielectric. (Higher values are better.)

RESISTIVITY - The ability of a material to resist passage of electrical current either through its bulk or on a surface. The unit of volume resistivity is the ohm-cm, of surface resistivity the ohm. (Higher values are better.)

SHRINKAGE - The volume loss of a cured material.

SURFACE RESISTIVITY - The electrical resistance between opposite edges of a unit square of insulating material. It is commonly expressed in ohms. (Also covered is ASTM D257-54T). (Higher values are better.)

THERMAL CONDUCTIVITY - The ability of a material to conduct/transfer heat.

VOLUME RESISTIVITY (SPECIFIC INSULATION RESISTANCE.) - The electrical resistance between opposite face of a 1-cm cube of insulating material commonly expressed in ohm-centimeters. (ASTM D257-61) (Higher values are better.)

Handling & Physical Properties

A – STAGE - Uncured thermosetting resins. Form of resins used for impregnation. At this stage, they are both soluble and fusible. See also B-Stage and C-Stage.

ABRASION - The wearing away of a surface by rubbing or scraping.

ADHESION - The state in which two surfaces are held together by inter-facial forces which may consist of valence forces or interlocking action or both.

AGING - The change of a material with time under defined environmental conditions, leading to improvement or deterioration of properties.

AMBIENT - The existing atmospheric conditions such as pressure and temperature.

AQUEOUS - Solutions or mixtures containing water.

B – STAGE - Intermediate stage in the reaction of a thermosetting resin in which the material softens when heated and swells in contact with certain liquids but does not entirely fuse or dissolve. See also A-Stage and C-Stage.

BOND STRENGTH - The amount of energy required to break a bond usually measured in psi.

BUBBLE - A spherical void trapped within a plastic material, created by trapped air.

C – STAGE - The final stage in the reactions of thermosetting resins in which the material is relatively insoluble and infusible. State of thermosetting resins in a fully cured part. See also A-Stage and B-Stage.

CENTIPOISE - A measurement of viscosity, conveniently and approximately defined as the viscosity of water at room temperature. The following table of approximate viscosities at room temperature may be useful for rough comparison:

<i>Liquid</i>	<i>Viscosity in Centipoises</i>
Water	1
Kerosene	10
Motor Oil SAE 10	100
Castor Oil: Glycerin	1,000
Corn Syrup	10,000
Molasses	100,000

COHESION - The force holding a substance together.

COMPRESSIVE STRENGTH - The capacity of a material to resist a crushing force.

CONFORMAL COATING - Thin layers of resins applied to electronic devices for protection against mechanical, electrical and chemical environments.

CRAZING - Fine cracks which may extend in a network on or under the surface or through a plastic.

CURE - To change the physical properties of a material by chemical reaction, which may be condensation, polymerization or vulcanization; usually accomplished by the action of heat and catalysts, alone or in combination, with or without pressure.

CURING AGENT - A reactive chemical which causes a resin to cure. Also called "hardener" or "catalyst".

CURING TEMPERATURE - Temperature at which a material is subject to curing.

CURING TIME - The time that it takes for a material to achieve 95-100% of full electrical and physical properties.

DEGASSING – (a) Opening and closing of a mold to allow the escape of gases and or moisture vapor early in the molding cycle (b) Evacuation of air in a polymer or reservoir.

DENSITY - Weight per unit volume of a substance.

DIMENSIONAL STABILITY - The ability of a material to retain its exact shape and dimensions under normal operating conditions.

ELONGATION - The increase in length of a material under tension.

EXOTHERMIC - Indicating a chemical reaction which generates heat. Amount of exotherm is usually mass sensitive.

EXUDATION - The formation of a liquid on the surface of a cured plastic. Also called "sweat out".

FILLER - Inert material added to a polymer to improve thermal conductivity, flame retardancy and coefficient of thermal expansion to name a few.

FISH EYE - Any small globular mass in a plastic which has not blended completely into the surrounding material, creating somewhat the appearance of fish's eye.

FLASH - Excess of molding material which flows out of the cut-off when mold is closed.

FLASHPOINT - The temperature at which a flammable material produces enough vapor to ignite on application of a flame.

FLEXURAL STRENGTH – Materials ability to resist deformation under load.

GEL TIME - The time required for a mixed resin and hardener system to gel from the time of mixing.

HARDENER - A reactive chemical which causes a resin to cure. Also called "curing agent" or "catalyst".

HEAT SINK - Any device that absorbs and draws off heat from a hot object, thereby neutralizing the extreme temperature.

HEAT-DISTORTION POINT - The temperature at which a test bar deflects under a given flexural load and a prescribed amount of heat.

STORAGE/SHELF LIFE - The typical period of time during which a material can be stored under specified conditions and remain suitable for use by manufacturer. (Doesn't necessarily indicate product beyond date is not suitable)

HYDROPHILIC - A substance which absorbs, or has a strong affinity for, water.

HYDROPHOBIC - A substance which does not absorb, nor has little/no affinity for, water.

HYGROSCOPIC - The ability to absorb and retain atmospheric moisture.

IMPACT STRENGTH - Ability to withstand shock loading or work required to fracture under shock loading a specified test specimen in a specified manner.

IMPREGNATE - To saturate reinforcement with plastic.

INERT - Not chemically reactive.

IZOD IMPACT TEST - A test designed to determine the resistance of a plastics material to a shock loading. It involves the notching of a specimen, which is then placed in the jaws of the machine and struck with a weight pendulum. See also Impact Strength.

LAMINATE - To join sheets or layers of a material with a bonding agent. Epoxies are often used to laminate fiberglass cloth.

LIGHT STABLE - Resistant to fading as a result of exposure to light.

MECHANICAL ADHESION - Adhesion between surfaces in which the adhesive holds the parts together by interlocking action.

MIL - .001" inch.

MIX RATIO - The amount of Part A to Part B that provides optimal properties

MODULUS OF ELASTICITY - The rate of stress to strain in a material that is elastically deformed.

MOISTURE RESISTANCE - The ability of a material to resist absorbing moisture from the air or water immersion.

MOLD - The cavity or matrix into or on which the plastic composition is placed and from which it takes its form.

PIGMENT - A finely divided, insoluble material that imparts a color to the substance to which it is added.

PINHOLE - Tiny hole in surface of, or through, a material.

POST CURE - In certain polymers complete cure and ultimate mechanical properties are attained only by exposure of the cured polymer to a specific elevated temperature profile after initial cure. This second stage is the post-cure and is necessitated by the fact that the higher temperatures would result in excessive reaction if used throughout the entire cure.

ROOM TEMPERATURE - 77°F / 25°C.

SET-UP - To polymerize or harden, as in curing.

SHEAR STRENGTH - (a) The ability of a material to withstand shear stress. (b) The stress at which a material fails to shear.

SHORE HARDNESS - A method and measurement scale of determining the hardness of a plastic material. A pointed gage is forced into the plastic material. The resistance to penetration is recorded on a graduated scale. Shore A is for softer materials and Shore D is for harder materials.

SOLVENT - A liquid used to dissolve another material.

SPECIFIC GRAVITY - The density (mass per unit volume) of any material divided by that of water at a standard temperature.

SUBSTRATE - A material upon the surface of which an adhesive containing substance is spread for any purpose, such as bonding or coating.

TACK - The stickiness of an adhesive material, measured as the force required to separate an adherent from it by viscous or plastic flow of the adhesive and without failure of the adherent.

TACK FREE TIME - The time required for the surface of a curing material to be dry to the touch.

TEAR STRENGTH - Force required to initiate or continue a tear in a material under specified conditions.

TENSILE STRENGTH - The strength of a material in tension or longitudinal stress.

THERMOPLASTIC - A type of plastic that is capable of being reformed repeatedly by heating.

THERMOSET - A plastic that cures through chemical means to an essentially infusible or insoluble material.

THIXOTROPY - The property by which some compositions become semi-solid at rest and liquefy again on agitation.

VISCOSITY - The flow resistance of a liquid.

VOLATILE - Capable of evaporating.

WORKING LIFE - The period of time after mixing that a resin and hardener mixture remains liquid and workable. Usually varies with the amount of mixed material and the ambient temperature.

Tooling

CAST - To form a plastic material into a desired shape by pouring into a mold.

FLEXIBLE MOLDS - Molds that can be stretched to remove cured plastics.

MOLD SHRINKAGE - The immediate shrinkage a molded part undergoes when removed from a mold and cooled to room temperature.

MOLD MARKS - A defect or parting line in the mold imparted to the molded material.

MOLD RELEASE - An agent used to prevent adhesion.

ORANGE PEEL - Uneven surface somewhat resembling that of an orange peel.

PARTING LINE - Mark on a molded piece where sections of mold met in closing.

SPRUE - The main opening into a mold cavity through which a plastic material is introduced into the mold.

UNDERCUT - Any recess, indentation or protrusion from a piece beyond the direct line of draw.

