

## **A Glossary of Terms Used in the Adhesives, Coatings and Elastomers (ACE) Sector**

### **Abrasion resistance**

The ability of the coating membrane to resist mechanical action such as foot traffic and particles, which tend to progressively remove material from its surface.

### **Acid value**

A measure of the residual acidity of a substance (measured in mg KOH/g) needed to neutralize acidity.

### **Adherend**

See substrate.

### **Adhesive failure**

Failure that occurs at the adhesive/adherend interface.

### **Aliphatic isocyanate**

Offer notable chemical resistance, color and gloss retention. Excellent resistance to weathering and ultra-violet degradation.

### **Aromatic isocyanate**

Utilized for interior applications that require excellent chemical and abrasion resistance. On exterior exposures it chalks and yellows. It is formulated primarily for primers and intermediate coats, as well as top coats. Aromatic isocyanates are used in the formulation of coatings in particular.

### **Branching**

Lateral extension points in a polymer chain.

### **Carbodiimide**

In the presence of special catalysts, isocyanates can condense with the elimination of carbon dioxide to form carbodiimides that then react reversibly with additional isocyanate to produce uretonimine.

### **Cast, Casting**

The filling of essentially open molds with liquid mixtures of polyurethane reactants or liquid monomers allowing them to polymerize in situ. A "CPU" is a cast polyurethane.

### **Catalyst**

A substance that accelerates a chemical reaction without itself being consumed. Examples: amines, tin, mercury.

### **Component**

When applied to polyurethane manufacture, a component is one of at least two reactive materials that are mixed together to form a polymer.

**Condensation polymerization**

A polymerization reaction in which two or more molecules combine with the production of by-products, such as water.

**CPU**

Cast polyurethane

**Crosslinking**

Formation of bridges between different polymer chains.

**Crystallinity**

State of repeated, and ordered, molecular organization.

**Emulsion**

Isocyanate prepolymers can be dispersed or emulsified with the aid of suitable dispersants and high-shear mixing to form an oil-in-water emulsion.

**Encapsulant**

A urethane system used to encase a component to protect it from environmental exposure.

**Filler**

An inert material added to polyurethane to increase viscosity, reduce costs and improve sag. Examples: silica, calcium carbonate.

**Fisheyes**

Defect in the surface of a coating caused by improper wetting of the substrate.

**Flash-off or drying period**

Time required for the carrier solvent to evaporate from a wet film.

**Functionality**

The number of reactive groups in a chemical molecule.

**Gardner color**

Gardner scale used to measure the color of liquids (compared to a set of standards). It ranges from 1 to 10, with 1 being the lightest color and 10 being the darkest.

**Gel time**

The point at which the urethane mass has cured sufficiently to support deflection without a permanent compression set.

**Green strength**

The strength of the urethane polymer immediately after the reaction occurs.

**GRP**

Glass-reinforced polyester resin.

**Hard segment**

A short part of a polymer chain composed of identical units or monomers. A hard segment has a high softening or melting point and is rigid at room temperature.

**Isocyanate**

A substance containing an isocyanate ( $-N=C=O$ ) group. A polyisocyanate contains more than one isocyanate group.

**Isocyanurate**

A trimeric reaction product of an isocyanate having a ring structure. Isocyanurates are characterized by their good thermal stability.

**MDI**

Diphenylmethane diisocyanate

**Molecular weight**

The sum of the atomic weights of all the atoms in a molecule. Each atom has an "atomic weight", which is related to its mass compared with that of one atom of carbon-12 (mass = 12).

**Monomer**

A substance that can be converted into a polymer.

**Percentage solids**

The part of the coating or adhesive that forms the dry film/bond, the rest being volatile material.

**Plasticizer**

A non-reactive liquid added to an isocyanate to reduce the melting point, improve flexibility, improve flow characteristics or reduce crosslinking (e.g., dioctylphthalate).

**Polyester**

A polymer containing ester linkages. The polyesters used in polyurethane technology contain reactive hydroxyl end groups.

**Polyether**

A polymer containing ether linkages. The polyethers used in polyurethane technology contain reactive hydroxyl end groups.

**Polyol**

A chemical substance containing one or more hydroxyl groups. A diol, triol and tetrol contain 2, 3 and 4 hydroxyl groups, respectively. Polyols are reacted with isocyanates to make polyurethanes.

**Polymer (copolymer)**

A high-molecular weight substance, natural or synthetic, that can be represented as a repeated small unit (monomer). A copolymer contains more than one type of monomeric unit.

## **Polymeric (crude) MDI**

Undistilled MDI composition made by the phosgenation of polyamine mixtures. It is available with functionalities from 2.5 to over 3.0. It is typically dark brown in color.

## **Polyurea**

Diisocyanates react with diamines to yield polyureas. The reaction is very fast and results in a strong polymer popular for coating applications.

## **Polyurethane**

Reaction product of an isocyanate with a polyol.

## **Pot life**

The total time that a urethane masterbatch is chemically stable.

## **Potting compound**

Also referred to as an encapsulant. Two-part urethane used to protect a component from environmental exposure.

## **Powder coating**

Durable, high gloss coating used especially on metal. The product is typically a mixture of a solid, branched polyester polyol and a solid "blocked" diisocyanate, usually IPDI. It is powdered and applied by electrostatic powder spray or by hot-dip coating and then baked.

## **Prepolymer**

A polyurethane reaction intermediate made by reacting an isocyanate with a polyester or polyether polyol, in which one component (usually the isocyanate) is in considerable excess of the other.

## **Primer**

Coating used to promote bonding between two substrates.

## **Pure MDI**

White solid consisting of 4,4' MDI that is produced by separation from a polymeric MDI precursor. It can be used in its basic form or modified chemically to give a liquid at room temperature.

## **Rheological agent**

Controls sag and flow of material. Examples are fine particle-sized fillers, castor oil derivatives and clays.

## **Salt fog spray**

An accelerated aging test to determine a coating's resistance to salt water spray in a natural environment.

## **Saturated**

An organic substance in which all the carbon-carbon bonds have their full complement of hydrogen atoms.

**Segment**

A short part of a polymer chain composed of identical units. A hard segment has a high softening point or melting point and is rigid at room temperature; a soft segment has a low softening point or melting point and is flexible or rubbery at room temperature.

**Shelf life**

Time during which a chemical is still useable for its intended application.

**Shore hardness**

A measure of penetration hardness, the Shore A scale is typically used for soft materials and the Shore D scale is calibrated for hard materials.

**Soft segment**

A short part of polymer chain composed of identical units. A soft segment has a low softening point or melting point and is flexible and rubbery at room temperature.

**Substrate**

Material to which a coating or adhesive is applied (e.g., wood, metal, concrete).

**Surfactant**

Surface-active agent that helps in mixing incompatible components in a reaction mixture. In water-based systems, a surfactant helps control gas bubble formation.

**TDI**

Abbreviation for toluene diisocyanate. Typically supplied as an 80:20 mixture of 2,4'-TDI and 2,6'-TDI isomers.

**TMXDI**

Abbreviation for m- and p-tetramethylxylene diisocyanate.

**Tack-free time**

The point at which the urethane mass loses its stickiness or adhesive quality.

**Tear strength**

Pulling force per thickness of sample.

**Tensile strength**

The maximum force per unit of cross-section area that a membrane can sustain when it elongates before rupturing. This property may be a measure of the membrane to withstand normal movements in the substrate without rupturing.

**Thermoplastic**

A polymeric material that may be formed and reformed by the application of heat and pressure.

**Thermoset**

Material that may be formed and polymerized by the application of heat and pressure. Once reacted by the application of heat, thermosets cannot be reformed.

**Thixotrope**

Substance added as a thickener and to control sag (e.g., clays, calcium carbonate, fumed silica).

**Top coat**

Usually the last coat to be applied, often onto a primer coat. This normally decorative coating (color, texture) has to be functional and therefore must be of high quality.

**Urethane**

Reaction product of an isocyanate with an alcohol. Repeating unit of a polyurethane polymer.

**Urethane alkyd**

Resins with hydroxyl end groups made by the reaction of hydroxyl terminated esters of unsaturated fatty acids with a diisocyanate, usually TDI. Dissolved in hydrocarbon solvents and air-cured in the presence of metallic driers.

**Uretonimine**

In the presence of special catalysts, isocyanates can condense to form carbodiimides, which then react reversibly with further isocyanate to produce uretonimine, tri-functional, cyclic structures. Uretonimine improves the low-temperature stability and hydrolytic resistance of an isocyanate material.

**Viscosity**

A measure of a material's resistance to flow.

**Volatile Organic Compound (VOC)**

Organic compounds that upon application escape into the atmosphere and react with nitrogen oxides in the presence of heat and sunlight to form ozone.

**Water vapor permeability**

The ability of a membrane to retard the flow of water vapor.