

Difference Between Polyurethane and Polycrylic

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Key Difference – Polyurethane vs Polycrylic

Polyurethane and polycrylic are widely used as coatings to protect various surfaces of household items. Both are synthetic polymers that are widely used as rheological modifiers as their properties can be easily altered by changing the chemical reactions. The key difference between polyurethane and polycrylic is that **polycrylic contains non-cross-linked copolymers of acrylic acid, methacrylic acid, and their simple esters**, whereas **polyurethane contains urethane linkages with various functional groups depending on the application.**

What is Polyurethane?

Polyurethane is a heterogeneous polymer that contains a urethane linkage within the polymer chains. The pure urethane groups (-NH.CO.O-) usually do not contain major functional groups. However, it is still possible to incorporate desired functional groups into the polymer network in order to obtain the desired properties that will suit a particular application. Because of this ability, the polyurethane can be obtained in the form of rigid thermosetting material or soft elastomer. Usually, thermosetting polyurethanes have very high tensile strength, abrasion resistance, toughness, and high degradation resistance. Most importantly, it can be used as a biomaterial owing to its biocompatibility.



Figure 01: Truck bed liner using permanent ArmorThane polyurethane spray-on protective coating

The first polyurethane elastomers were synthesized by reacting high-molecular weight glycols and aromatic diisocyanates. Thermoplastic polyurethane elastomers were first discovered in 1958. Presently, polyurethanes are produced by reacting a polyol (an alcohol that contains more than two reactive hydroxyl groups) with a diisocyanate. Due to the availability of various types of diisocyanates and a wide range of polyols, it is possible to synthesize polyurethanes with a broad spectrum of properties that meet various types of applications. Moreover, the nature of the polyurethane elastomers can be controlled by the choice of [monomers](#), monomer ratios, addition sequence, and the method of [polymerization](#). Low density, flexible and fatigue resistance polyurethanes are used to manufacture cushions, while polyurethanes with good abrasion resistance, strength and durability are used for applications like shoe sole manufacturing. Thermal insulation, rigidity, and strength of polyurethane are important in building panels, while the electrical insulation, oil resistance, and rigidity are considered when using them in electrical and electronic equipment industry. Moreover, polyurethanes are widely employed in a wide range of applications, including, machinery, furnishings, paints, sealants, adhesives, textiles, paper-making, packaging, and medicine.

What is Polycrylic?

Polycrylic is a brand name of water-based protective paint which is made mainly using polyacrylates. Acrylic coatings are extremely resistant to water. Therefore, the polycrylic is widely applied as coatings to protect the wood and other household items from water and other solvents. Polycrylic is available in two forms: high gloss and satin finishes. Like polyurethane coatings, polycrylic can be applied with a roller or

spray bottle. Unlike most oil-based polyurethanes, polycrylic is completely clear and does not retain any color on the surface. It is a very affordable product that can be ideal for use on light wood surfaces such as maple, birch, ash, etc. In addition, polycrylic is also compatible with water-based wood stains. The coating is durable and suitable for frequently used surfaces such as desks and tables. Due to low [viscosity](#), polycrylic is difficult to apply, especially on vertical surfaces. When compared with polyurethane coatings, polycrylic coatings dry very fast, so it is quite difficult to apply on large surfaces. Thin films are recommended as thick films result in milky surfaces.



Figure 02: Polycrylic

What is the difference between Polyurethane and Polycrylic?

Polyurethane vs Polycrylic

Polyurethane is a heterogeneous polymer that contains a urethane linkage within the polymer chains.

Polycrylic is a brand name of water-based protective paint which is made mainly using polyacrylates.

Content

Polyurethane contains urethane linkages.

Polycrylic contains copolymers of acrylic acid, methacrylic acid, and their simple esters.

Applications

Polyurethane is used in coatings, machinery, furnishings, paints, sealants, adhesives, textiles, paper-making, packaging, and medicine.	Polycrylic is used as a water-based coating.
Type of Coating	
Polyurethane is water and oil based.	Polycrylic is water-based.
Films	
Polyurethane oil-based films are yellowish, while water-based films are transparent.	Polycrylic films are transparent.
Scratch Resistance	
Polyurethane has a very high scratch resistance.	Scratch resistance is low compared to polyurethane coatings.
Drying Time	
Polyurethane takes some time to dry.	Polycrylic dries very quickly.
Surface	
Polyurethane provides a shiny surface	Polycrylic doesn't provide a shiny surface.

Summary – Polyurethane vs Polycrylic

Polyurethane and polycrylic are widely used synthetic polymers. Polyurethane is widely used in many applications like paints, adhesives, machines, electronics owing to their properties that can be altered between rubber and plastic phases. Polycrylic is a commercial water-based paint that gives durable finishes, especially for frequently used wooden surfaces. Polycrylic coatings are difficult to apply when compared with polyurethane coatings. However, polycrylic coatings are easily removable but less durable than polyurethane coatings. This is the difference between Polyurethane and Polycrylic.

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Image Courtesy:

1. "Truck bed liner using permanent ArmorThane polyurethane spray-on protective coating" By ArmorThane – PC file (CC0) via [Commons Wikimedia](#)
2. "A clear coat on raw wood" by Ryan McFarland ([CC BY 2.0](#)) via [Flickr](#)

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