Trivex

Trivex was originally developed for the military, as visual armor. PPG Industries took the technology and adapted it for the optical industry. Trivex is a urethane-based pre-polymer. PPG named the material Trivex because of its three main performance properties. The three main properties are superior optics, ultra-lightweight, and extreme strength.

Trivex has a high abbe value. Abbe value is a measure of the dispersion or color distortion of light through a lens into its color elements. Abbe number can also be referred to as v-value. The higher the abbe number, the less dispersion, the lower the number, the more dispersion. Trivex has an abbe number of 43-45. This is significantly higher than polycarbonate. Polycarbonate's abbe number is 30. Trivex has a very high level of light transmittance. The level is 91.4%. This is one of the highest levels of all lens materials. The high percentage is a factor that directly affects the brightness, clarity, and crispness of Trivex.

Trivex has a specific gravity of 1.11. Specific gravity is the weight in grams of one cubic centimeter of the material. Specific gravity is also referred to as density. The higher the number, the more dense, or heavy, a lens material is. Trivex has the lowest specific gravity of any commonly used lens material. This makes Trivex the lightest lens material. Trivex is 16% lighter than CR-39, 25% lighter than 1.66, and 8% lighter than polycarbonate! Trivex has a refractive index of 1.53. This allows for a thinner lens than a CR-39 lens. It can also be surfaced down to a center thickness of 1.0mm. This ability further reduces weight and thickness.

They are as strong, or stronger than polycarbonate for impact resistance. Trivex is able to pass the ANSI Z87.1 High Velocity Impact Test. This test is a requirement for safety lenses. The lens must have a center/edge thickness of 2.0mm. The test consists of a mounted lens being subjected to a 1/4-inch steel pellet being hurled at the lens at a velocity of 150ft per second. The FDA also requires lenses to be impact resistant. Their test consists of a 5/8 inch steel ball being dropped from a height of 50 inches onto a lens. Trivex not only passes the test at 2.0mm center thickness, it can even pass the test at a center thickness of 1.0mm.

Lenses made from Trivex are very chemical resistant. They are even resistant to acetone. Polycarbonate is not resistant to acetone. Under normal conditions, Trivex is resistant to most commonly used household and optical cleaners and solvents. Cleaners such as Windex and alcohol are safe to use on Trivex.

Trivex lenses do not have the internal stress that is associated with most polycarbonate lenses. This is due to the way Trivex lenses are manufactured. Internal stress can cause lens breakage and is often referred to as birefringence. Birefringence can blur vision. The lack of internal stress makes Trivex a perfect choice for drilled and grooved rimless. Trivex does not crack around drill holes like polycarbonate. These cracks are often called "spider cracks." Lenses in a drill mount sometimes experience hole elongation. This is due to the flexing and stress that happens to the lens. This can cause lenses to become loose and cause the frame to get out of adjustment. Trivex lenses retain their shape and are not subject to hole elongation.

Trivex lenses provide 100% UV blockage of both UV-A and UV-B radiation. This is inherent in the lens material. Trivex lenses are also very scratch resistant. This is especially important when comparing Trivex and polycarbonate for kids. I have read some literature that puts Trivex's scratch resistance at twice that of polycarbonate!

Bob Fesmire, ABOC

Polycarbonate

Born from the space race in the 1960′s and introduced to the ophthalmic lens market in the late 1970′s, polycarbonate has been around the block a few times and enjoys a sizeable market share, particularly in children’s and safety eyewear due to its superior impact resistance.

With a higher index of refraction and lower specific gravity, polycarbonate lenses are thinner and lighter than their plastic and glass counterparts. Inherent UV protection and wide product availability also contribute to its popularity.
Polycarbonate, however, is not without its drawbacks. One of the chief complaints about polycarbonate is its optical quality, or lack thereof.
With an Abbe value of 29, polycarbonate's chromatic aberration is the highest of any lens material in use today. Furthermore, with the increase in popularity of drill mount frames, some dispensers are hesitant to use polycarbonate because of its lack of tensile strength and likelihood of cracking around drill holes.

Trivex

Introduced in 2001 by PPG, as the only lens material other than polycarbonate to pass FDA Impact Resistance Test (@ 1mm CT), the High Velocity Impact Test, and meet ANSI Z87.1 '89 standards, Trivex has been slowly increasing in both popularity and availability. While Trivex has a slightly lower refractive index (1.53 compared to 1.58), it's specific gravity, 1.11g/cm3, makes it the lightest of any lens material available today. Like polycarbonate, Trivex also has inherent UV protection. However, unlike polycarbonate, Trivex has an Abbe value of 45, making it optically superior. Further distinguishig itself, Trivex is ideal for drill mounting. The tensile strength of Trivex makes it highly resistant to cracking around drill holes, so much in fact, Younger Optics guarantees its Trivex products (Trilogy) for life, against stress fractures and drill mount cracking.

Hi-Index Lenses:

Are made of a special plastic material that refracts light in a different way than regular plastic lenses. With hi-index lenses, vision can be corrected with less material, making the lens much thinner. Plastics are graded in numbers, such as 1.50 or 1.67. The higher the number, the thinner the lens. Because they are thinner, hi-index lenses are also lighter, making them more comfortable to wear. This is important to patients with high prescriptions, as their glasses can be made more cosmetically attractive and appealing. Hi-index lens materials tend to cost more than standard plastic lenses.

Polycarbonate Lenses:

Are made of a type of plastic that is more impact-resistant than standard plastic lenses. Polycarbonate lenses are also much thinner and lighter in weight. They are considered a high index plastic. Polycarbonate lenses also have built-in ultraviolet protection. Because of these properties, it is the lens material of choice for children's lenses, sport lenses and safety lenses. However, some people complain that polycarbonate lenses fail to give them the crispest, clearest vision.

Trivex Lenses:

Is a relatively new material that is similar to polycarbonate lenses but with higher quality optics, and thus provides clearer vision. Trivex is lighter in weight than standard plastic but not quite as thin as polycarbonate. Trivex is a more rigid material, making it a better selection for rimless or drill mount frames. Trivex is just as impact resistant as polycarbonate and may also be prescribed for children's lenses, sport lenses and safety lenses.

Aspheric Lenses:

Design gives several advantages to eyeglass lenses. An aspheric lens has flatter peripheral curvatures than a regular spherical lens. This reduces the amount a lens may bulge out of an eyeglass frame, reducing magnification of the eyes, which improves cosmetic appearance. Flatter peripheral curves also reduce distortions that occur when looking away from the center of the lens, making vision much crisper. Aspheric lenses are also much lighter in weight than standard spherical lenses.

Anti-reflective Coatings:

Is applied to eyeglass lenses to reduce the amount of internal and external reflections on a lens. This increases the amount of light transmitted through the lens, which improves quality of vision. Anti-reflective coating also decreases unwanted glare and halos at nighttime. It also makes the lenses appear somewhat invisible and very thin. While everyone could benefit from an anti-reflective coating, it is especially beneficial for people with high prescriptions, people who have a decrease in vision at night, and professions in which cosmetic appearance is important.

Scratch-Resistant Coatings:

Are applied to the front and back of lenses in the manufacturing process. Although it is important to realize that no lens is scratch-proof, this special coating does make lenses harder to scratch when dropped or rubbed against a hard surface. While most lenses are made with scratch-resistant coating, sometimes the term scratch-resistant coating indicates a type of "scratch warranty." These warranties guarantee against scratches, ensuring the lenses will be remade if a scratch does occur. Be sure to clarify any warranty of this nature.

Ultraviolet Treatments:

Is applied to lenses to protect against harmful UV sunrays that can accelerate the development of cataracts and macular degeneration. It is extremely important to protect eyes from the damaging effects of the sun. UV treatment is easy to apply to lenses and is often included with the purchase of eyeglasses.

Polarized Lenses:

Usually used to make sunglasses. They are available most commonly in grey or brown tint but many other colors are available. Vertically polarized lenses decrease bright glare and reflections by blocking horizontal polarized reflected light. Polarized lenses have been used by fishermen for years to better deal with bright light being reflected off water and to see deeper into the water.

Photochromatic Lenses:

Have a special chemical coating that makes them change to a dark tint in the sunlight and turn clear indoors. Photochromatic lenses are great for people who do not wish to carry a separate pair of prescription sunglasses. It is important to recognize that these lenses do not darken as well while driving a car. The windshield prevents most of the UV light from reaching the lens.