

## **Lens coatings: functional safety eyewear increases user compliance**

*Keeping an eye on lens coating technology*

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Protective eyewear is a crucial part of any safety program and there are many different kinds of eyewear on the market from which to choose. Their design, features, functionality and even the materials from which they are made all affect their performance. Lens coatings are one of those features that have a major impact on the effectiveness of protective eyewear. Choosing the right lens coatings not only help keep employees safe and comfortable in the workplace, but can also translate into fewer injuries, increased productivity and an overall healthier bottom line.

Advances in plastic lens technology, particularly the development of polycarbonate material, have created incredibly strong, flexible and lightweight lenses. Polycarbonate lenses, because of their higher refractive index (they bend light more than glass), are thinner and lighter than both standard plastic and glass. They also have higher impact resistance than glass, which shatters under force, making polycarbonate lenses the lens of choice for protective eyewear.

Polycarbonate lenses, however, do not inherently feature scratch resistance, glare reduction, anti-fog capabilities or laser protection — they require coatings to provide clear vision and performance for different work environments. Various coatings can be applied to improve scratch, impact and chemical resistance, protect against ultraviolet (UV) and infrared (heat) radiation, and provide anti-fog properties for work environments where excess moisture is present. When combined with coatings and tinting, polycarbonate lenses can provide a complete eyewear protection package. Polycarbonate lenses provide lightweight, comfortable eye protection that lasts, improve user compliance and safety, and contribute to increased profitability and productivity.

## **Lens coatings: specialized eyewear enhances user safety and compliance**

Increasing compliance for eye protection is one of the most effective means to increase worker safety and profitability. Non-compliance with OSHA and ANSI standards can result in lost production and worker injury. In fact, according to the U.S. Bureau of Labor Statistics, eye injuries lead to 37,000 missed days of work and more than \$300 million per year in related costs — not including costs from legal fees, judgments and training replacement workers, which bring that number to more than \$900 million.

Simply put, lens coatings improve compliance because workers tend to keep their eye protection on when they are able to see their work clearly. Lens coatings provide clear vision through improved scratch resistance, wavelength filtering and anti-fog properties. With improved fabrication techniques and manufacturing methods, companies now produce lens coatings for almost any application. From common hardcoat to mirror coatings designed for outdoor use, manufacturers offer product lines with an array of options and benefits. Advances with lens coatings include new and improved anti-fog formulations, added UV protection and protection from chemical splashes. In addition, in some coating formulations, such as laser protection, lens coatings are creating a new set of rules in the protective eyewear industry.

## **Scratch-resistant hardcoat: sharper vision and “like new” appearance**

No lens material, including glass, is entirely scratch proof, making it important to treat lenses with a clear, hard coating. Scratch-resistant hardcoat — perhaps the largest category of lens coatings — provides longer life for the lens and extended visual clarity. For best results, protective eyewear should be cleaned and cared for according to the manufacturers instructions. It is also important to remember that even with a protective scratch-resistant hardcoat, eyewear is susceptible to damage from everyday wear and tear, and should be replaced if it becomes scratched or otherwise damaged.

### **Fashion meets functionality with mirror coatings**

While polycarbonate lenses do offer inherent UV protection (98 to 99 percent), mirror coatings are often used to enhance that protection and comfort the eye when exposed to infrared radiation in hot environments. Mirrored lenses are frequently used in conjunction with a tinted lens and are ideal for general purpose sun and glare protection in work environments such as landscaping, construction, ground and air transportation, and utilities. A light application of a mirrored coating to a clear lens works well for work conditions that require frequent transition between indoor and outdoor activities, such as operating a forklift at a receiving dock. In addition, some workers may be more willing to wear protective eyewear due to the stylish appearance of the mirror coatings.

### **From factories to freezers: anti-fog lens coatings clear the air**

Certain environments and some types of eye protection, such as high coverage eyewear and goggles, are particularly susceptible to fogging due to the lack of airflow around the lenses. When a lens fogs it temporarily interrupts the wearer's field of vision, which can lead to a potentially dangerous situation. To help minimize fogging, manufacturers apply anti-fog coatings to improve the performance of the eyewear.

Currently, there are two distinct anti-fog lens coatings that work for different moisture levels. Hydrophilic (water loving) lens coatings absorb water into the coating matrix and evaporate moisture. They are most effective in moderate moisture situations, including many factory settings (food processing plants, for example), or when an individual's body heat is warmer than outside temperatures due to physical exertion. Hydrophobic (water repelling) coatings create a sheeting action where the water quickly slides off the surface of the lens, without impairing the user's vision. Hydrophobic coatings are useful in environments that are very steamy, where exertion levels are high, or where people transition between work in very low temperatures (freezers) and higher temperatures (outside in humid climates). However, a major disadvantage of hydrophobic anti-fog coatings is that they are not permanent and easily erode after repeated cleanings.

One innovation that has created a stir in the market is technology that creates an anti-fog lens for all seasons and all environments. Leading manufacturers, like Uvex, have implemented this technology and therefore are able to offer protective eyewear that features both hydrophilic and hydrophobic properties. When the lens is exposed to extreme moisture or humidity, its hydrophilic properties kick in and moisture is constantly absorbed and released by the lens. If the lens reaches a point of saturation, the hydrophobic properties take over and cause the moisture to sheet on the lens. The best of these coatings are permanently bonded to the lens and also offer anti-static and anti-scratch properties. These coatings deliver anti-fog protection in an array of environments so workers are less likely to remove or change their protective eyewear. This

improved user compliance delivers better safety results, and helps ensure that OSHA requirements are met.

### **Lens coatings for any wavelength**

In addition to general purpose anti-scratch, mirrored and anti-fog lens coatings, the technology has evolved to such a degree that lens coatings can be used for highly specialized laser applications. These coatings are an important feature of eyewear designed for individuals who work with lasers in applications such as medical, dental and industrial. These coatings work in the narrow part of the spectrum, acting like a mirrored lens, reflecting harmful laser light away from the eyes while allowing more visible light through. These highly specialized coatings can even be tuned to protect against defined laser wavelengths, providing very specific protection for users and enhancing the precision of their work.

### **Summary**

Lens coatings offer a variety of uses and applications. In each and every formulation they provide critical properties to enhance protective eyewear. The options that are available today benefit workers in most environments, encouraging higher compliance levels. They increase the eyewear's chemical resistance, UV and infrared protection, and ensure visual clarity by increasing scratch or fogging resistance without detracting from the comfort levels characteristic of lightweight polycarbonate eyewear.

With advances in technology, new coatings are being developed all the time to address the safety needs of the marketplace. With so many coating options, choosing the right option can sometimes be confusing. Fortunately, manufacturers can assist companies in selecting the proper eyewear and lens coatings for specific work environments, and in doing so can help them deliver effective protection levels that meet strict ANSI and OSHA guidelines. Selecting eyewear and coatings that offer the best functionality, style and comfort can help increase user compliance. The results are a safer workplace, fewer incidents of eye injury, and ultimately increased productivity and profitability.

\*As published in *Occupational Hazards*, Sept 2006