Drivewear®, a New Lens Category for a Long-standing Need

OPPORTUNITIES

David Rips

Drivewear® lenses combine a polarizing filter with photochromic technology to improve vision across the wide range of conditions encountered in driving.

Most Americans now spend considerable amounts of time in a car. We commute in cars, we run errands in cars, and we take a car to virtually all of our activities. Driving involves using our eyes in a wide range of visual conditions, including low light, overcast, bright sun, and high glare. No current lens improves visual function in all these conditions. When Younger Optics worked with Transitions Optical, Inc. to create Drivewear®, our goal was to create a lens that could improve visual function across the full range of conditions encountered behind the wheel.

COATING DRIVEWEAR®

No performance benefit can come from adding mirror coatings to Drivewear lenses, and, therefore, its makers recommend against it. Antireflective (AR) coating, however, can enhance Drivewear lenses' functionality. Back surface AR coating reduces annoying reflections from behind the wearer. While back surface AR coating provides the biggest benefit, many laboratories prefer to coat both front and back. There is no problem doing this with Drivewear.

The Technology Behind the Lens

Drivewear brings together two leading lens technologies, NuPolar® polarization and Transitions™ Photochromic Materials, to create an entirely new category of lens. In marrying these two technologies, the product that emerged was more than the sum of its parts. That is, although standard polarized lenses do a good job of blocking glare, most are too dark to meet the range of conditions encountered in driving; and while traditional photochromic lenses have worked well for people moving between indoors and outdoors, they do not darken significantly behind the windshield of a car (since the windshield blocks the ultraviolet [UV] light that activates the photochromic material). Nor did photochromic lenses offer polarization, which is the only way to block blinding glare.

To create a lens that would assist visual function across this wide range of conditions, my company, Younger Optics, contributed its excellent polarizing filter, while Transitions Optical offered world-class photochromic technology.

Developing the Lens

In the past, polarizing filters were by nature limited. Light-colored polarizers (eg, light green or sky blue) were attractive, but they typically provided poor polarization levels. When checked with a standard glare demonstrator, they offer hardly any glare reduction at all. So, the first requirement for Drivewear was a polarizer that was not only light in color but also highly efficient. After much testing and experimentation Younger Optics was able to develop a high-contrast, yellow-green color that had the necessary level of polarization efficiency.

Car windshields absorb most UV light; so the UV inside a car—even when the car is in bright sun—is insufficient to fully activate traditional photochromic materials. The development of Drivewear lenses required the creation of a photochromic dye that could be activated by short wavelength visible light as well as by UV. Because one wants traditional photochromic lenses to be unreactive to visible light (so as to prevent unwanted darkening indoors), creating the photochromic materials for Drivewear presented a very difficult and unusual problem for Transitions Optical and its chemists.

CONSUMER TARGETS FOR DRIVEWEAR®

- ☑ Drivers and commuters who need sun and glare protection
- ☑ Elderly drivers
- ☑ Parents
- ☑ Professional drivers
- ☑ Patients buying their primary pair of glasses

Lens Materials

The lens substrate material that many companies, including Younger Optics, use is different from that used by Transitions. Marrying our technologies required us to reformulate many of the basic techniques that each company had perfected for its individual product. Entirely new casting cycles and chemistries were developed that would work not only in the development of polarized lenses

FIGURE 1 Drivewear® shown in its resting state with only moderate visible or UV light hitting the lens. In this state, the main characteristic of the lens is the color of the yellow-green high-efficiency polarized filter. This color was engineered to maximize transmission of useful light to the eye while providing glare protection when needed. In this state, the transmission of the lens is approximately 37%, but, to the wearer, it appears as if more than 37% of the light is being transmitted. This is attributed to the high-contrast characteristics of the polarizing filter that removes background light scatter from the visual signal.

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but also in the secondary process by which Transitions adds photochromic capability.

As a general rule, polarizing film does poorly when exposed to the high temperatures of the photochromic process. So Younger Optics had to develop a heat-resistant polarizing film that maintained the necessary high efficiency and color fastness of its other polarizing films. The new technology developed is so successful that it has been incorporated into NuPolar's standard line. As a result, NuPolar products can now successfully receive antireflective (AR) coating and stand up to high temperature hard coat processing.

POLARIZED LENSES vs DRIVEWEAR®

Polarized lenses are created by sandwiching a thin piece of polarizing film inside the lens matrix. The film, which resembles a piece of plastic wrap, is dyed using iodine crystals or dichroic dyes. When the film is stretched, the iodine crystals or dye molecules align to create a polarizing matrix. Specular reflection, the cause of much blinding glare, is linearly polarized, and by aligning the polarizing film at 90 degrees to the principal polarization of reflected glare, glare is effectively blocked. Polarized lenses work well in bright sunlight, including behind the windshield of a car. Although they block blinding glare, efficient polarized lens are often too dark for use during overcast or inclement weather. In addition, these lenses are always just one color.

Color Technology Brings Driving Comfort

When light intensity is low, the natural or rest state of the Drivewear lens is a light yellow-green color that maximizes the amount of useful light transmitted (Figure 1). Thus, when it is overcast, the lens allows as much light as possible to get to the eye, while still removing the glare that can exist, even in low-light conditions.

With increasing light levels, Drivewear begins to darken to a deep copper color, which many drivers find to be the most comfortable and best color for driving (Figure 2). This is not surprising, because this color removes excess light while highlighting reds and greens for good traffic signal recognition. In bright outdoor light (which is rich in UV), Drivewear turns to a deep dark brown (Figure 3). This color was selected and designed for maximum filtration of excess light. In this light condition, Drivewear performs much as any high quality dark polarizer would, providing maximum protection from bright light and blinding glare.

Who Can Benefit?

Drivewear lenses are, of course, designed with drivers in mind. There are other patient groups to consider, however, when offering the lens. For example:

Seniors: Older patients have slower reaction times and so need every advantage they can get. Drivewear's greatest benefit for older drivers is the increased contrast in overcast conditions. Increased contrast also allows red and green traffic lights to remain noticeable in darkened conditions. This may even help elderly patients notice a light change up ahead sooner than they might otherwise.

Parents. Drivewear is also helpful for the busy parent. In a car with children talking, televisions playing, and cell phones ringing, knowing that you have the best available vision is knowing you are taking the best possible care of your family. I personally would love to see the day when, just as any person immediately puts on a seat belt when getting in the car, people put on their Drivewear lenses.

Outdoor Enthusiasts. A foggy morning round of golf can have transformed by mid-morning into a very bright, sunlit game. Individuals who experience a range of changing light conditions will readily appreciate the light, high-efficiency polarizer of Drivewear that allows optimum vision in low-light conditions as well as in bright light.

FIGURE 2 Increased ambient visible light causes Drivewear® to darken to a deep copper color. In this state, Drivewear is designed to remove both excess light and to provide good traffic signal recognition by highlighting reds and greens. Light transmission is approximately 25%. Polarization removes glare.

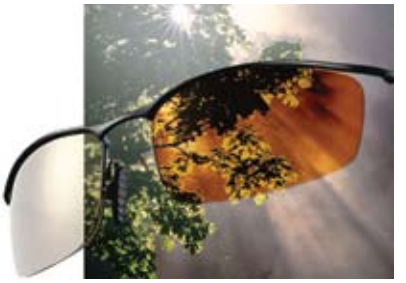

FIGURE 3 Drivewear® reaches its third phase in bright outdoor conditions, where it turns a deep dark brown. This color was selected for maximum filtration of excess light. In this state, transmission is approximately 10% and the lens performs much as any high quality dark polarizer would to provide maximum protection from bright light and blinding glare.

Professional Drivers. The men and women who spend most of their waking hours behind the windshield of a vehicle experience a much wider range of light and weather conditions than the rest of us. Whether it's glare from the road, the sun, or oncoming traffic, professional drivers experience it all—and almost every day. Only Drivewear is designed to provide these people with the ability to see their best in such a wide variety of circumstances.

Drivewear, however, is not for night driving, as most highway safety

EDITOR'S NOTE: This article is part of a series called "Opportunities" in which we feature new technologies and services. Since, in many cases, there is limited experience with the product offered, we go directly to the source, the company, for information, which we present from the company's perspective. All of the normal caveats—and excitement—that pertain to new ideas and technologies apply. Our aim is to help readers stay on the cutting edge of practice.

experts agree that no tint should be used for driving in the dark. (AR-coated clear lenses are the choice for night driving.)

Drivewear and Your Practice

The target market for Drivewear is literally anyone who drives a car. Plano Drivewear is available for emmetropes, while semi-finished Drivewear blanks are available to accommodate prescription powers from +8.00 D to –6.00 D in both single vision and Image® progressive (1.00-3.00 D adds) designs. Indeed, Drivewear is a "no-brainer" second pair sale. While patients often don't see why they should pay a lot for high-quality sunwear, it becomes clear to patients when they see the unique features of Drivewear lenses.

In addition, as an extra benefit, Drivewear lenses block 100% UVA and UVB in all lighting conditions.

The high-quality polarized lenses that broke into the prescription lens market in the 1990s quickly set the standard for sunglasses. Prescription polarized eyewear is often an expensive item that patients resist. But the combined technologies of Drivewear set it apart from the rest of the marketplace and make the price/value equation attractive to patients. When dispensing Drivewear lenses, practitioners can feel confident that they are prescribing a product that is unique and unparalleled in either the prescription or non-prescription sunwear area.

THE BOTTOM LINE

Drivewear offers prescription and plano eyewear that aims to meet the wide range of visual conditions that drivers encounter. This is accomplished by marrying Younger Optics NuPolar polarizing technology with Transitions Optical photochromic technology. Drivewear lenses are able to sense and react to a range of light conditions both outdoors and behind the windshield of the car. In addition to glare and excessive light protection, Drivewear enhances red and green traffic signal recognition.

David Rips is president and chief executive officer of Younger Optics. This article was written with the assistance of David Kellner, editorial director of *Refractive Eyecare*, and Heidi W. Moore.