

PLASTIC

Photochromic LENSES

by John M. Young
Senior Research Engineer
American Optical Corp.

When considering a new product for introduction, it is important to first determine if there is a need or desire for the product. Even if the product is unique, uniqueness alone cannot guarantee that it will be successful if there is no demand for the product by the end user. Studying the history of similar products is also important in determining past trends, the present situation and what the future may promise. The true value of a new product, therefore, can be established for the marketplace through the use of these criteria. The same criteria are just as relevant for photosensitive plastic lenses.

The history of the photochromic lens dates back to ap-

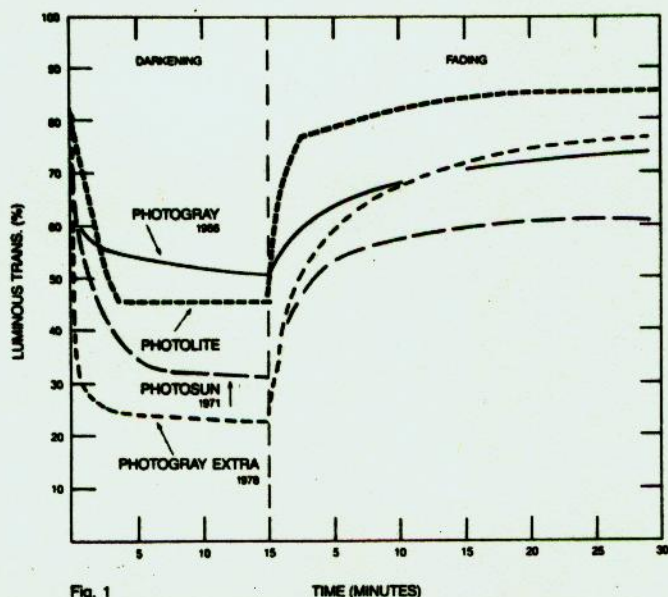


Fig. 1
The PhotoSun lens, as seen in Figure 1, had a luminous transmittance of about 65% in its clear state, darkening to approximately 30% LT when activated. The PhotoSun lens was too dark in its recovered, or unactivated, state to

PHOTOLITE

proximately 1964 when Corning Glass scientists invented the photochromic glass lens, which was released to the industry in 1966 as the PhotoGray® lens. As illustrated in Figure 1, visual transmittance decreases when ultraviolet light activates the lens. The PhotoGray lens darkens from about 80% to 85% luminous transmittance (LT) to about 45% to 50% LT.

The early PhotoGray lenses were affected by variations in temperature, as also seen in Figure 1. As the temperature increased, the fully darkened transmittance decreased. Also visible in higher plus and minus prescriptions was a variation in the density, or luminous transmittance, across the lens due to the change in thickness. This early product also exhibited an apparent "memory." Over time, the change in transmittance would become less and the lens would not fully recover from its darkened state. Boiling the lenses would restore them to their original reactive state, however.

The effects of various temperatures and the "memory" characteristic of the PhotoGray lens were corrected in later innovations by Corning, even though the PhotoGray lens was considered "state-of-the-art" and minor nuances were accepted. Some bifocal styles were added in 1967. However, the PhotoGray lens was and is still considered a fashion product and does not get dark enough to fulfill a sunglass requirement.

It wasn't until 1971, with the introduction of single-vision PhotoSun® lenses, that Corning had a true sunglass prod-

uct. The PhotoSun lens, as seen in Figure 1, had a luminous transmittance of about 65% in its clear state, darkening to approximately 30% LT when activated. The PhotoSun lens was too dark in its recovered, or unactivated, state to

be worn indoors or to be used for night driving, however. Fused bifocals then became available from Corning in 1975, through a cooperative program with domestic lens manufacturers that manufactured fused flat top bifocals. Systematic testing was carried out in the development of the product to assure good quality to the wearer.

The PhotoGray Extra lens was introduced in 1978; the result of a culmination of efforts over the previous twelve years from the first introduction of PhotoGray lenses. The transmittance of the extra lens in the clear unactivated state was approximately 85% LT, darkening very rapidly to approximately 25% LT when activated by ultraviolet light, as seen in Figure 1. The PhotoGray Extra lens' range of 60% light transmittance spanned the combined range of both previous products. The PhotoGray Extra lens could be considered an all-purpose spectacle product, representing the newest state-of-the-art in photochromics.

Manufacturers that are also prominent in the field of photochromic lenses include Chance-Pilkington of England, who introduced Reactolite in 1973. Later, Reactolite Rapide was introduced as a faster acting, darker lens, similar to Corning's PhotoGray Extra lens.

Schott Optical was licensed by Chance-Pilkington to produce a photochromic glass and, in 1974, it introduced a phosphate-based photochromic. Synchronvision Slate Gray, a borosilicate photochromic glass, was also introduced by Schott, and they became the only supplier of both phosphate and borosilicate photochromics. The Synchronmatic

