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(Supplementary to Circular C-421)

Spectral-Transmissive Properties and Use of Colored Eye-Protective Glasses

Information on the spectral transmissive characteristics of various tinted lenses, marketed under a variety of trade names such as Amethyst, Azurlite, Calobar, Cruxite, Polaroid, Roselite, Soft-Lite, Solarex, Viopake, Willsonite, etc., is given in Circular C-421 of the National Bureau of Standards, obtainable only from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of ten cents a copy, prepaid (stamps not accepted).

Commercial standards for the lenses used in sun glasses, commonly sold for sports use at beaches, etc., are available in mimeographed form from the Division of Trade Standards, National Bureau of Standards, Washington, D. C., on request. The titles of the standards are:

Ground-and-Polished Lenses for Sun Glasses, CS78-40

Blown, Drawn, and Dropped Lenses for Sun Glasses, CS79-40

The object of this circular is to supplement the data given in circular C-421 by giving information on tinted lenses newly advertised under a wide variety of trade names some of which apply to the same kind of glass. In some instances this may be misleading. For example, originally a smoky colored lens, known under the trade name "Crookes's lens" (C-421, pp. 11 & 12) contained the element didymium, which has strong absorption bands in the yellow part of the spectrum, that gave the lens a distinctive identification characteristic. Recently a pair of sun glasses that was labeled simply "Crookes' Lens", was found to have the characteristic absorption bands of didymium, whereas a similar glass marked "Genuine Crookes' Lens" did not show these absorption bands. In his original paper on the manufacture of tinted lenses Crookes described also a ferrous sage-green colored glass, which was the forerunner of modern eye-protective glasses that absorb the ultraviolet and the infrared. This forms the third kind of "Crookes' Lens" sometimes on display in stores.

Much can be learned about the light-protective properties of tinted lenses by noting their color. Hence in circular C-421 the various lenses are grouped under the predominating color;

amber, green, blue, etc. An amber lens has that color because the blue and violet rays are absorbed - the degree of absorption depending upon the kind of glass. Similarly bluish-green, sage-green and greenish-yellow glasses have that color because both the violet and the red ends of the spectrum are absorbed. Hence, in considering the sales promotion of a new lens the purchaser can form some opinion of the advertising claims made for the lens by noting its color. Of course a radiometric test is required to obtain exact values.

The sage-green and blue-green glasses mentioned on p. 13 of C-421 offer the best protection from ultraviolet and infrared radiation. Among the tinted lenses described in C-421 is a sage-green colored glass called Calobar. Recently sun glasses having practically the same color and absorption characteristics of Calobar have been advertised under the following trade names: Absorb-O-Ray, Cool-Ray, Contra-Glare, Emerlite, Green-Ray, Ma-Lite, Olivette, Ray-Ban, Retna-Ra, Sun-Master, Verdex, etc. Pur-O-Ray is a recently promoted sun glass that has practically the same color and absorption characteristics as the Willsonite shade 2, blue-green (C-421, pp. 13 & 14).

The recently advertised "Therminon Lens" is practically colorless with some absorption in the ultraviolet and a relatively high transmission in the infrared. Apparently it was made of a glass similar to the light blue-green heat absorbing window glasses used in roof-lights to shut out infrared solar radiation. At the thickness used for roof-lights (6.3 mm) such a glass absorbs approximately 70% of the infrared. At sun glass lense thickness (2 mm) the infrared absorption is only about 40%, which is not much greater than that of an ordinary lens. Incidentally, high infrared absorption by sun glass lenses (which are not intended for use in welding operations and furnace work, for example) is not an important desideratum, although so advertised.

Recently examined productions of Amethyst Glasses (C-421, p.16) are Velvet-Lite and Kromatone. "Sportone" appears to be a dark shade (No. 4) of Kromatone. Such glasses are not suitable for protecting the eyes from ultraviolet and infrared rays; and only the darkest shades are effective in reducing the "Glare" of intense sunlight.

A recent improvement in Polaroid lenses consists in mounting the polarizing film between thin plates of a light shade of sage-green glass that absorbs the infrared (C-421, p.27).

New improvements in eye-protective glasses (Neophan, C-421, p.12) for use in oxy-hydrogen and oxy-acetylene metal cutting and welding operations are light-colored, blue-green to yellow-green glasses that intercept the ultraviolet and infrared rays and contain a sufficient amount of didymium to absorb selectively the yellow sodium rays, thus clarifying the field of view of objects in gas flames.