

photochromic.

# PHOTOCHROMATIC LENS

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(B.optom S.Y.B.M.C.O)

**What is UV ??????**

- **ULTRAVIOLET RAYS...**
- “LIGHT” or more properly, electromagnetic radiation with a wavelength shorter than 400 nm, is known as UV radiation.
- UV radiation can be further subdivided into four regions.
- UV A : 315 to 380 nm
- UV B : 290 to 315 nm
- UV C : 200 to 290 nm
- UV vacuum : 100 to 200 nm

- Overview...

## PHOTOCHROMIC LENSES

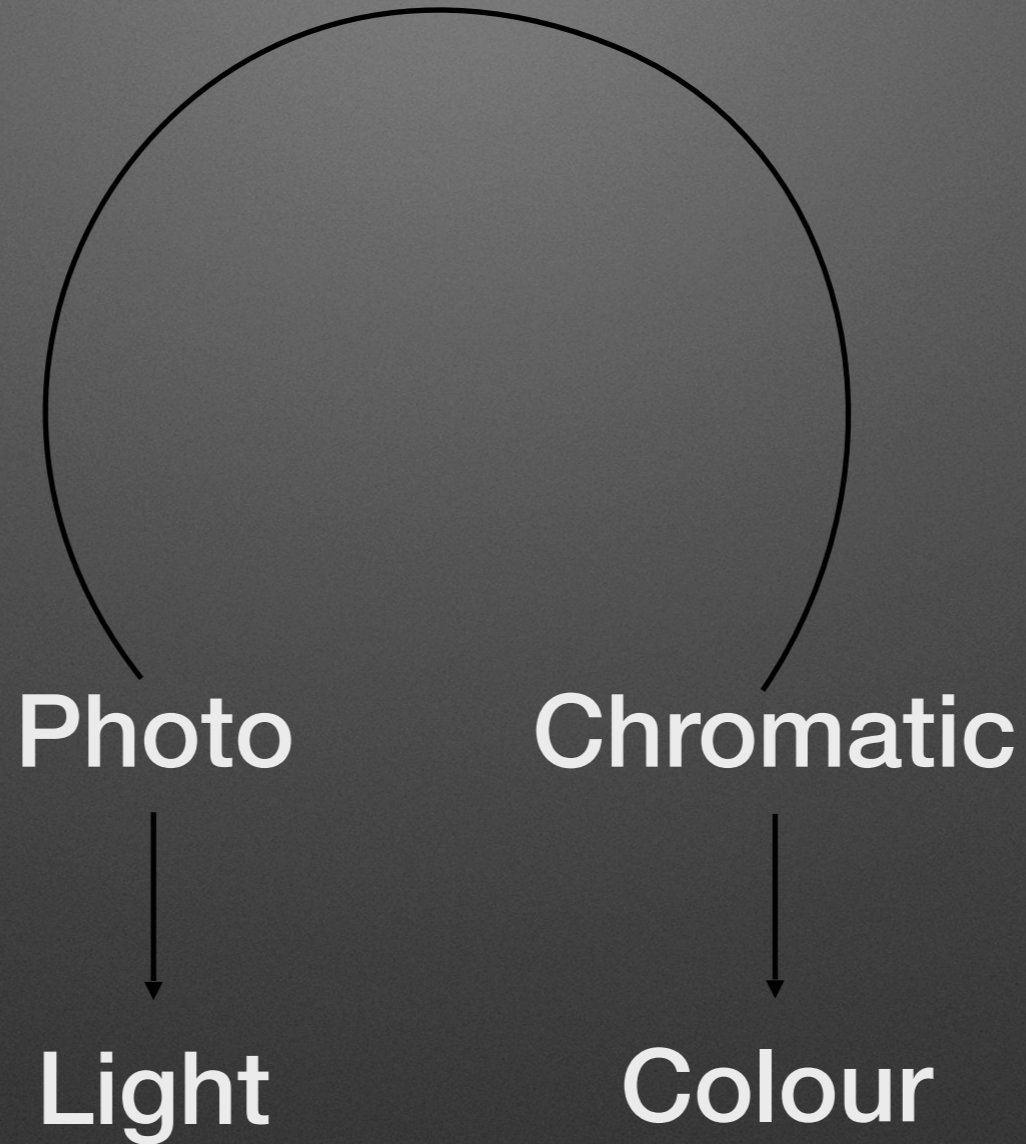


These are lenses that change their colour as per the brightness of the atmospheric light. From clear lenses in dark indoors, these change to fully dark ones in the bright sunlight, just like sunglasses.

LENS COLOR :  Grey  Brown

- **INTRODUCTION...**

**Photochromatic**



- Phenomenon that color of material is change by light irradiation.
- They are lenses that darken on exposure to UV radiation.
- Whether you glasses or not, eyes experience eyestrain e.g. T.V. , Computer , reading , sunlight etc... causing eye strain and watering.
- Photochromatic lenses can help your eyes to cope up as they react to different light conditions during the day.
- Gives a visual comfort a whether indoors or outdoors.

- OTHER NAME

- DAY & NIGHT
- TRANSITION
- PHOTO SUN LENSES
- PHOTO FUSION
- SUN SENSORS
- PHOTOLINE LENS

# • **HISTORY.....**

- Introduced in 1964 by Dr. WH ARMSTEAD and SD STOOKEY.
- In 1960 CORNING developed 1st glass photo chromatic lens.
- In 1980 AMERICAN OPTICAL developed 1st plastic photo chromatic lens it's called as photolite lens.
- They aware lenses high darken on exposure to UV or low temperature.



**Dr. WH ARMSTEAD**



**S.D. STOOKEY**



C  
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AMERICAN OPTICAL

# • TYPES OF PHOTOCROMATIC LENS...

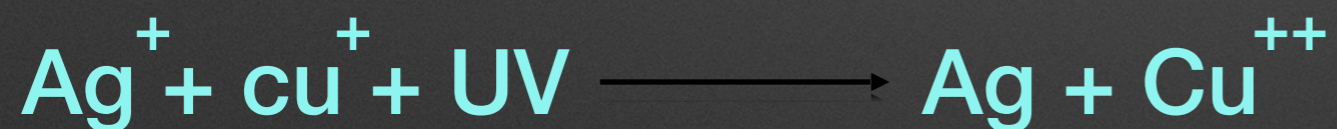


GLASS

PLASTIC

- **GLASS PHOTOCHROMATIC LENSES...**
- It contains microscopic crystal size about 5 nm in diameter of “**SILVER HALIDS**”.
- Silver halide crystals doped with copper are mixed in with the glass at the time of manufacture and in the borosilicate mixture used by corning.

It can be represented as:



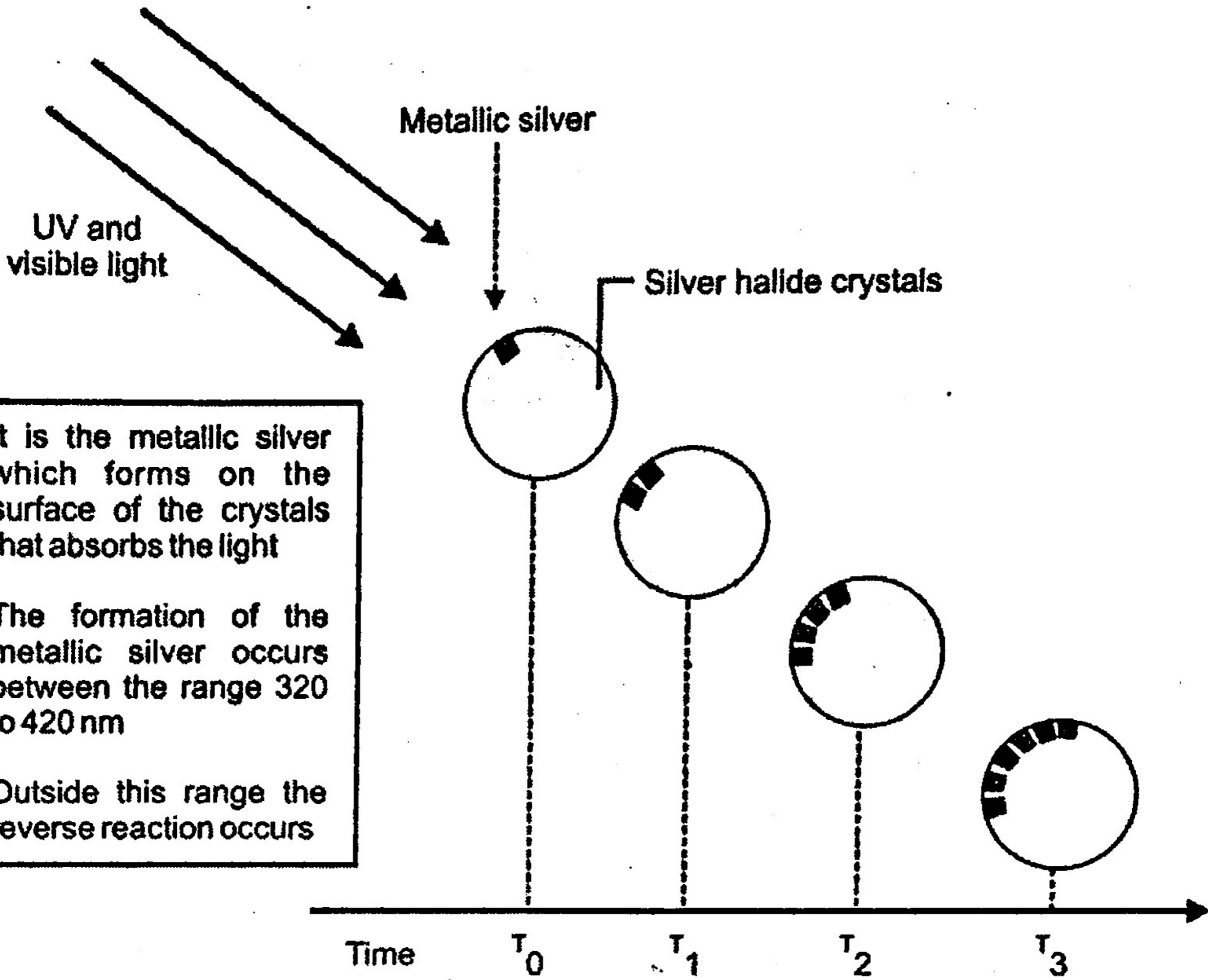
- **HOW THE PROCCCESS OF DARKENING AND FADING OCCURS ? ? ?**
- When **SILVER HALIDE** are exposed to UV rays or blue light of visible spectrum breaks into **silver** and **halogen** leading to darkening process.
- As **silver** is sets free it give rise to dark color.
- As **halogen** is held within the glass and combined with silver on removal of UV rays the lens return back to its original color i.e. the process of fading takes placed.

- Each glasses has got its own transmission range, fading range and reaction time.
- Transmission rates indicates the maximum and minimum transmission of UV rays and is written in fraction.

For e.g: 80/45

- Fading rate indicates the time taken to fade back to 70% of original transmission value.

- Reaction time is the taken to darken completely.
- Darkened and fading process depend on temperature also.
- Best line glasses has a reflective index 1.523 and is colorless in its inactivated stage becomes a pale brown colour on exposure to light.



- It is the metallic silver which forms on the surface of the crystals that absorbs the light
- The formation of the metallic silver occurs between the range 320 to 420 nm
- Outside this range the reverse reaction occurs

- **PLASTIC PHOTOCHROMATIC LENSES...**
- **ESSILOR** & **PPG** industries combines in 1990 to produce plastic photochromic lens known as **TRANSITION LENS** the second generation of this lens is now called as the **TRANSITION COMFORT LENS**.
- Rather than making use of silver halide this lenses owes its darkening to the presence of **SPIRO INDOLINE MOLECULES**.





- When activated by UV rays in sunlight the SPIRO-INDOLINE molecules scatters absorbing sunlight and reducing the amount of visible light generates the lens.
- When the lens is removed from sunlight the chemical reaction reverse and the lens return to its clear states.

- **AVAILABILITY OF DIFFERENT BRANDS...**
- Essilor : Transitions
- Zeiss : Photo fusion
- Corning : Sun sensors
- Rodenstock
- Vision rx : transitions
- Hoya : sun sensor



Transitions®

HOYA



*VISION*<sup>™</sup>  
*Rx Lab*

xperio<sup>™</sup>UV



RODENSTOCK  
See better. Look perfect.

sun<sup>®</sup>sensors  
by Corning



SunSensors®

by Corning



- **CORNING...**

- **Sun sensors** is photo chromatic product of **corning**.
- Glass work have introduced photogrey which darkened to grey tint on exposure to UV rays and slightly pinkish tint in its inactivated stage.
- It is most sensitive to the wave length 350-360 nm.
- Corning has recently introduced a lightweight high index plastic photo chromatic lens called as sun sensor.

- It has photo chromatic material uniformly distributed into the front surface of the lens, but has a penetration depth that is significantly thicker than the photo chromatic layer in transition lenses.
- This extra thick photo chromatic layer enables sun sensors lenses to change faster and get darker than other photochromatic lenses according to the company.
- **Sun sensors** is made by **HOYA** also.

# Transitions®

ADAPTIVE LENSES®



**Clear  
indoors**



**Crizal® Transitions®**

HIGH PERFORMANCE ADAPTIVE LENSES



**Darken  
outdoors**



Let's  
focus  
on sight

- **Transition...**
- Photo chromatic with a narrow variation in transmission between the faded and darkened states are promoted for the use in the city where light condition changes quickly between outdoors and indoor.
- They does not loose their photo chromatic effect even after 3-4 years.
- If one glass in a spectacle is broken then the option of changing the broken glass only and maintaining the color between both the glasses can be possible.



- This lens is made by **ESSILOR** , **VISION RX** , **BBGR**.
- Extra dark outdoors to protect from the brightest sun, even in the hottest condition.
- Darken behind the windshield of a car to protect eyes from sunlight while driving.
- Helps protect from **harmful blue light** indoors and outdoors.
- Designed to work with most prescriptions and frames.
- Block 100% of UVA & UVB rays.



# *Crizal*<sup>®</sup> | Transitions<sup>®</sup>

**Transitions<sup>®</sup> lenses** seamlessly adapt to the perfect tint in any light, shielding your patients' eyes from UV rays and blue light from digital devices.

Combine **Transitions<sup>®</sup>** with **Crizal<sup>®</sup> UV** to provide the optimum UV protection to your patients.

## ACTS LIKE A SHIELD AGAINST:



SCRATCHES



SMUDGES



REFLECTIONS



DUST



WATER



UV



**Speak to your Essilor Account Manager for more information.**

[www.essilor.com.au](http://www.essilor.com.au)





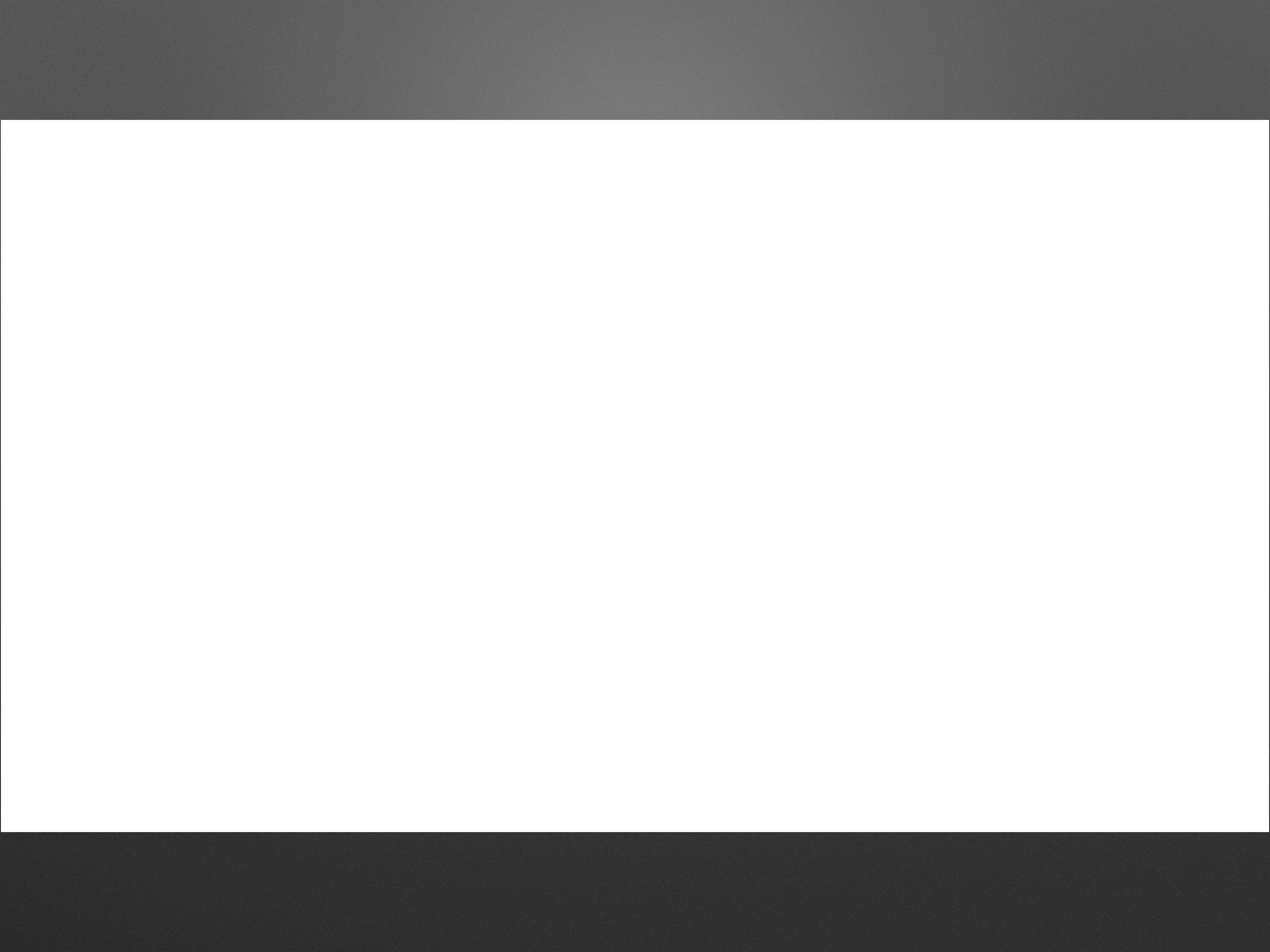
Photo fusion  
By: ZEISS



- **PHOTO FUSION...**

- The eye care innovation 2011 - **PHOTO FUSION**, the **ZEISS** high and mid-index self-tinting lenses, react up to 20% faster than previous photo chromatic lenses by **ZEISS**.
- Their darkening and clearing process is dependent on ambient temperature and on the intensity of the UV radiation to which they are exposed.
- The higher the intensity of the radiation and the lower the temperature, the darker the lens and the faster the darkening process.

- This means that maximum darkening is achieved in wintry conditions in mountainous regions the lenses become slightly less dark in summer heat.
- Maximum darkening is not possible in motor vehicles, as the windscreen absorbs UV radiation.
- In early days photo chromatic product of Zeiss is **TRANSITON.**



- **CHALLENGES OF PHOTOCROMATIC LENSES...**

- Depend on UV.
- UV spectrum change during the day.
- Variation of UV-A present during the day.
- Amount of activating UV needed.
- Life of photochrometic substance.
- Memory.



- **FACTORS AFFECTING TRANSMISSION**

**(1) INTENSITY :**

Increase intensity



Increased darkening



Decreased transmission

- (2) **Wavelength**: short wavelength increases darkening, it depends upon material.
- (3) **Temperature**: lower temperature, faster and deeper the darkening.
- (4) **Thickness**: more the thickness, more the material, more the darkening.
- (5) **Exposure**: newer lenses take time to darken.

# • **ADVANTAGES...**

- Photo chromatic lenses can help your eyes to cope up as they react to different light conditions during the day.
- Good photo chromatic lenses blocks 100% of most harmful radiation.
- Protects you from UV which can cause lost of harm to eye specially cornea & conjunctiva.
- Gives a visual comfort whether indoor or out door.
- Photo chromic are available in single vision, bifocal and omnifocal forms.

- **DISADVANTAGES...**

- The main disadvantage of the photochromatic lenses is they do not adjust immediately.
- It could take up to two minutes for the lenses to adequately change from light to dark or vice versa.
- Another disadvantage for some users is that they will not darken when worn inside vehicles because windscreen/green glass absorbs virtually 100% of UV light.

- It gradually loses its darkening ability with time.
- However, if the lenses are worn no longer than about 2 years.
- The decreased darkening is not likely to be noticed by the wearer.

# DISPENSING TIPS



- **DISPENSING TIPS...**

- Photo chromatic lenses are not as effective in hot climate.
- When temperature increase, the reaction slows.
- So, they are not recommended to replace sunglasses.
- Photo chromatic lenses do not lighten instantaneously when going from a bright to a dim area.

- Photochromatic do not always return to their maximum transmission, the additional reduction in illumination when driving at night may prove hazardous.
- Anti reflection coating will not reduce the range of the photochromatic cycles but as with any lens, will increase the transmission in both the lightened and darkened status.



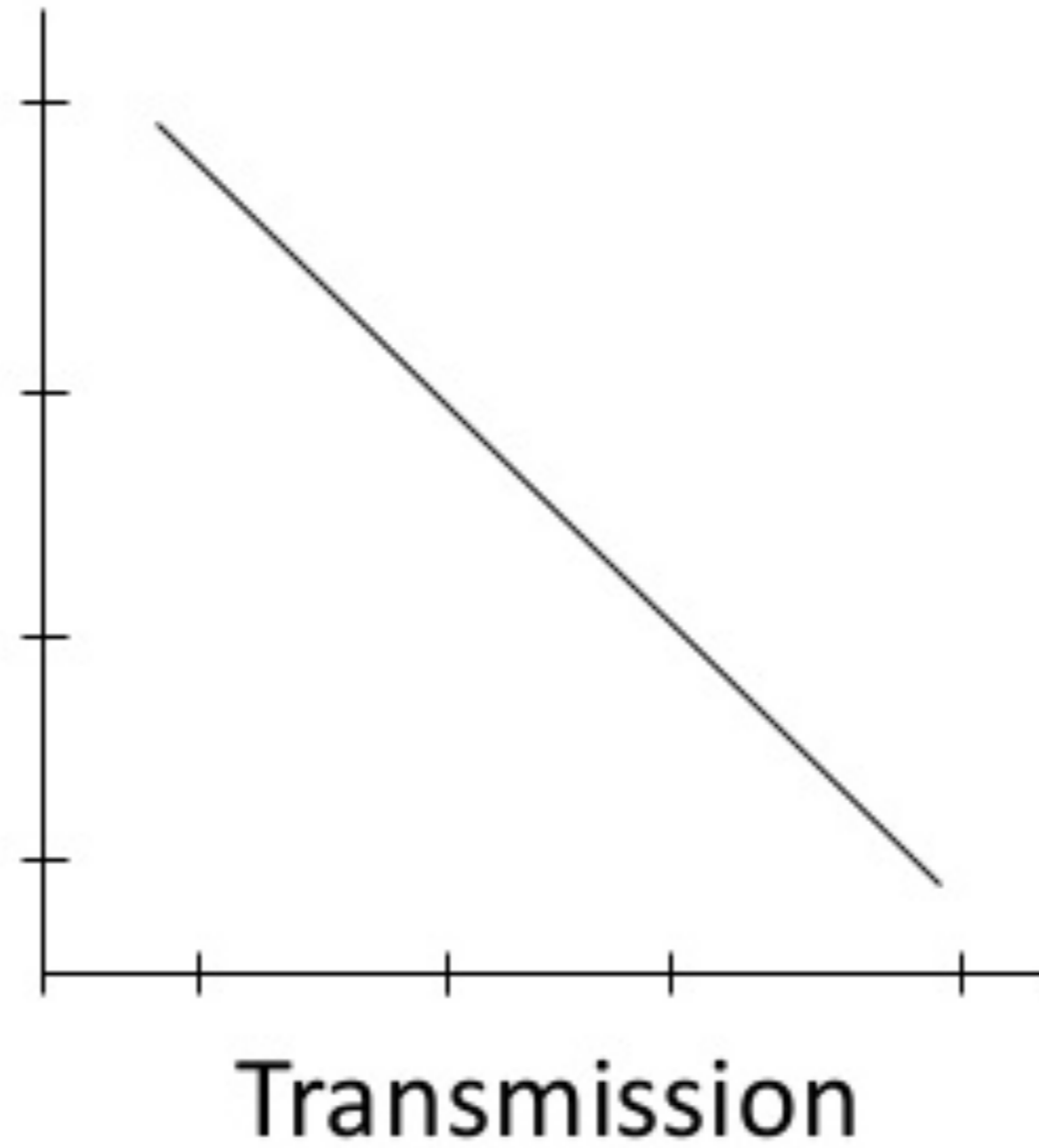
- **USEFUL KEY TO AVOID PROBLEM...**
- Always make sure that the new lens is of the same type as the same type as the old lens, i.e. , same brand , same thickness etc.
- If the old lens has been chemtemperated have it re-strengthened along with as the new lens.
- If the old lens has not been treated in anyway , place it with new lens in boiling water for half an hour.

## FEATURES...

- It darkens to comfortable sunglasses in bright sunlight in less than 1 min.
  - Fades back to virtually clear tint.
  - Light transmission is automatically adjusted to brightness to sunlight. photo chromatic lenses must be darkened and faded through many cycles to achieve
- 
- The image shows five individual lenses of varying sizes and tints, arranged on a dark surface. The lenses range from a very dark, almost black tint to a lighter, more transparent tint, demonstrating the range of darkness that photochromatic lenses can achieve. The lenses are arranged in a roughly circular pattern, with one lens in the foreground being the largest and darkest, and others of varying sizes and tints scattered around it.

# *GRAPHICAL REPRESENTATION*

- Darkness



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- **REFERENCES...**
- [Slideshare.com](#)
- [rachnaeyesafety.blogpost.in](#)
- Google
- Dispensing borish.

# SPECIAL THANKS...



- K.A.K.

- Najwa mam

# Thank You



*Thank You*

**Verily none can ever remain for even  
a moment without performing action  
for everyone is made to act  
helplessly indeed by the qualities  
born of nature.**

- Shreemad bhagvad geeta  
Adhyay : 3 Shlok : 5