

It is a must to Protect

Visible Light is produced within the spectrum of electromagnetic energy that include radio waves, microwaves, x-rays and **ultraviolet rays**. The cause of fading is due to a photochemical reaction involving UV and visible light.

UV Radiation

The UV radiation found in fluorescent lighting is present in two forms:

- UVB (280-320 nm)
- UVA (320-400 nm)

UVB rays pose a much greater risk of causing skin cancer than UVA rays. UV radiation has long been known to cause a myriad of health problems. Some sources indicate that fluorescent lights emit more UVB than the sun. In the 1992 edition of the [American Journal of Epidemiology](#) It was found that fluorescent lights emit "10-30 times more UVB radiation than the sun does." Of course UVB radiation has been found to be carcinogenic.

Fluorescent Lamps

Of the total electricity used to light a fluorescent lamp:

- Approximately 60% is required to produce UV radiation
- 20% of that UV radiation is used to produce visible light
- The remaining 80% is either emitted as UVA and UVB radiation, or is radiated as heat

People who work in the grocery, restaurant, food processing and deli industry know:

- Food that remains under fluorescent lighting for a short time spoils quickly
- As a matter of fact, the closer it is to the bulb, the faster the food spoils
- In 1997, Cornell University studies found that:
- 50 % of vitamin A and riboflavin in milk may be lost after only 24 hours of fluorescent light exposure

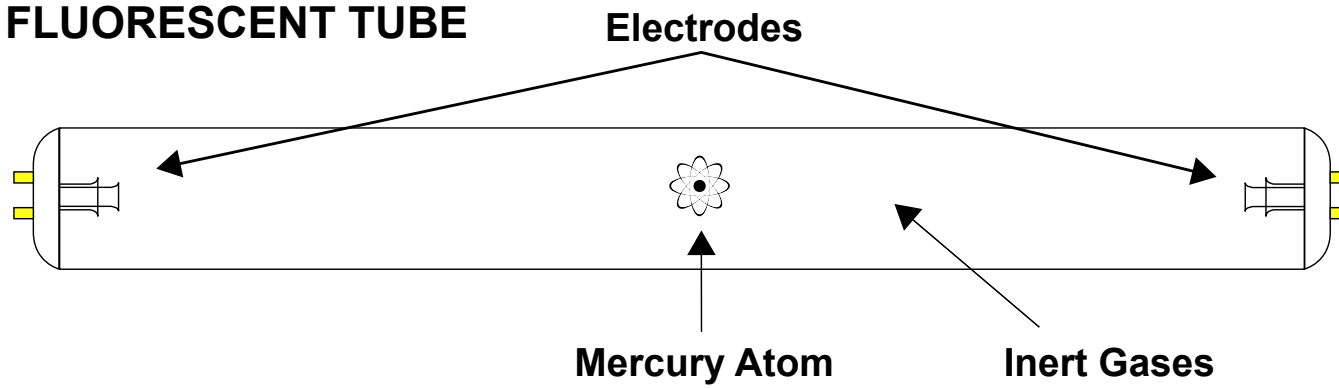
UV Radiation & Fading

- 40% of fading is caused by UV rays
- Another 25% of fading is due to heat, with 25% being caused by normal visible light
- The remaining 10% cause of fading is from indoor artificial lighting, humidity and poor saturation
- Visible light and UV radiation cause fading in the cloth materials used to cover books

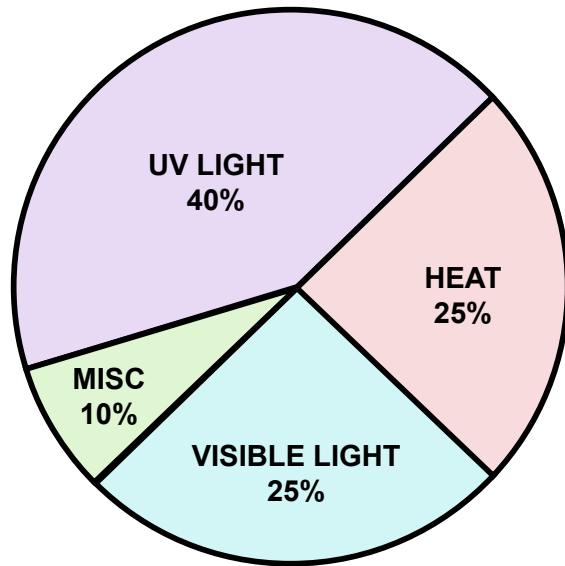
Damaging Wavelengths

- Electromagnetic energy is measured in nanometers (nm)
- UV is present from 100-400 nm
- Visible light is present from 400-700 nm
- That means that energy that exists from 100-700 nm is responsible for 65% of all fading

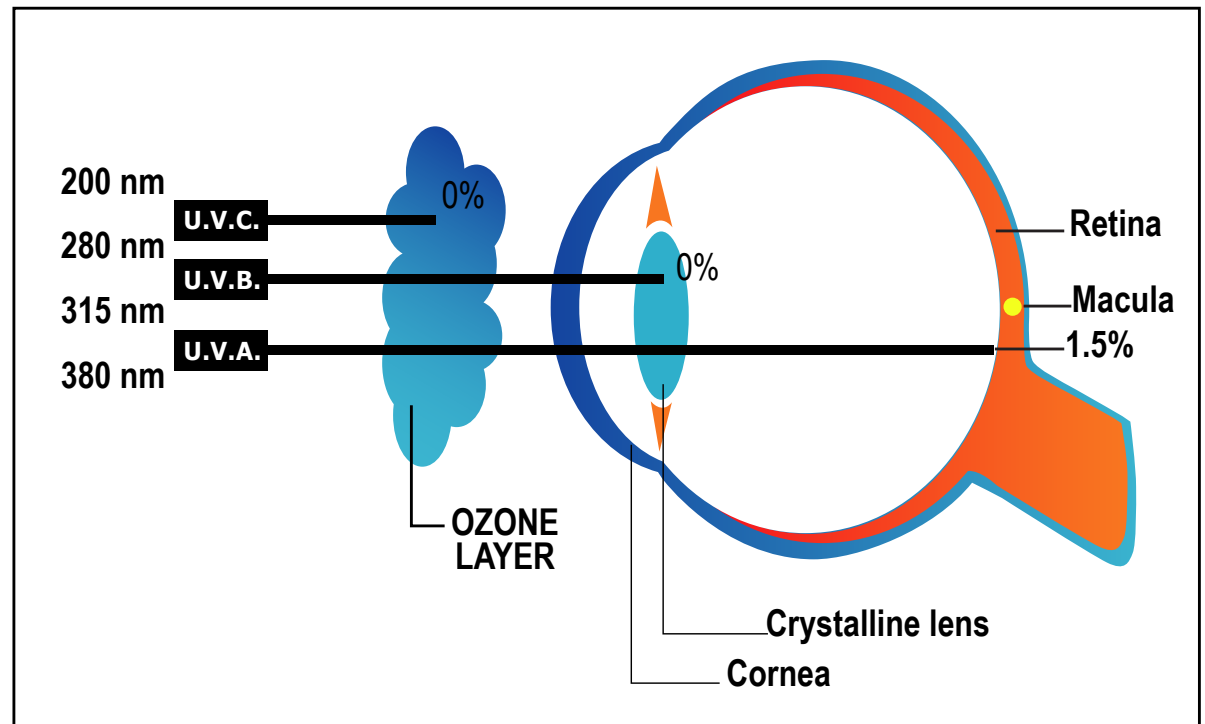
FLUORESCENT TUBE

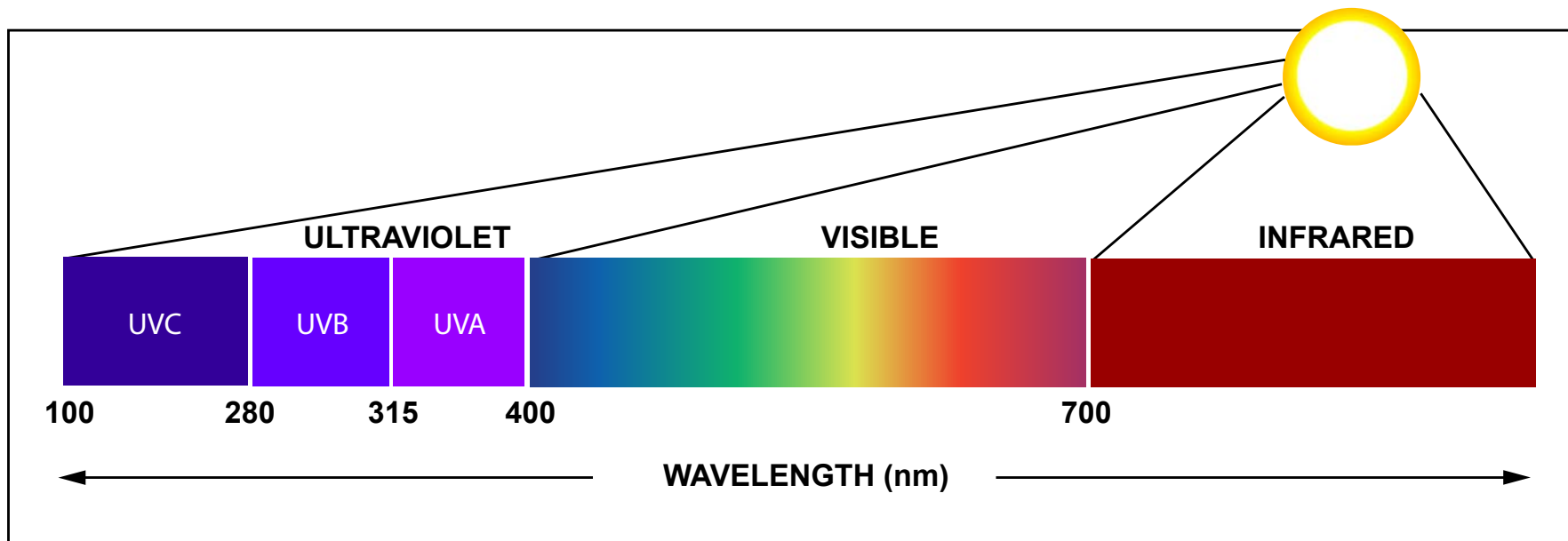


Fading Factors



Eye Injury





- **UV-A rays cause more serious long-term damage**

They penetrate and ruin your carpets, fabrics, window treatments, wall coverings, and fine wood furnishings.

- **UV-B** rays quickly bleach and burn surface colors

We know how to protect

- Artwork
- Ceramics
- Fabrics
- Manuscripts
- Photographs
- Rare Documents
- Tapestries

GAM UV protective materials approved by:
American National Standards Institute (ANSI)

Choose from:

**Window
Grip™**

UV Sheets UV Rolls

GAM TUBE™

SUPER TUBE™

GamColor®
Deep dyed polyester color filters

GamChroics™



Gallery: La Luz de Jesus Gallery in Hollywood, CA • Artist: Tamara Guion

GAM UV ROLLS

24" x 16' 6" Junior Roll
24" x 50' Roll
48" x 25' Roll

Rolls are ideal for larger areas such as display cases. The material can be easily cut to fit special sizes with a matt knife or scissors.



GAMTUBE™

T2 to T12, up to 8 feet
and for bi-axial lamps.

GAMTubes™ are reusable sleeves that slide easily onto fluorescent lamps, and are available in any GAMColor®.



GAM UV SHEETS

20" x 24" Sheets

Sheets are ideal for small cases and sleeves. Trim to fit with matt knife or scissors.



WINDOWGRIP™

48" x 25' Rolls

Adhesive backing makes application to windows easy for semi-permanent installations. Can be peeled off for easy removal. Apply to windows where harmful ultraviolet rays need to be blocked.



GAMCHROICS™

Custom sizes

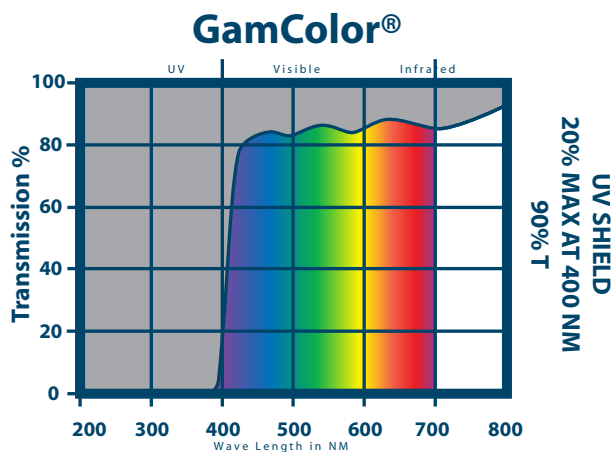
Glass dichroic filters in custom sizes block infrared and/or ultraviolet light. GAMCHROICS™ are also available in decorative colors.



Protection from 200 to 400 nm

Protect your rare and precious documents, photographs, paintings, and fabrics from the destructive effects of ultraviolet light.

Fluorescent lamps and sunlight emit high levels of UV light. High energy radiation in the 200 to 400 nanometers segment of the electromagnetic spectrum can be most harmful to paper, paintings, parchment, dyes and pigments of all kinds. GamColor® clear, colorless polyester film effectively filters 97% of the ultraviolet radiation in this wavelength band, preventing colors from fading. The images below illustrate how a color print can fade after long term exposure to UV light.



FADING

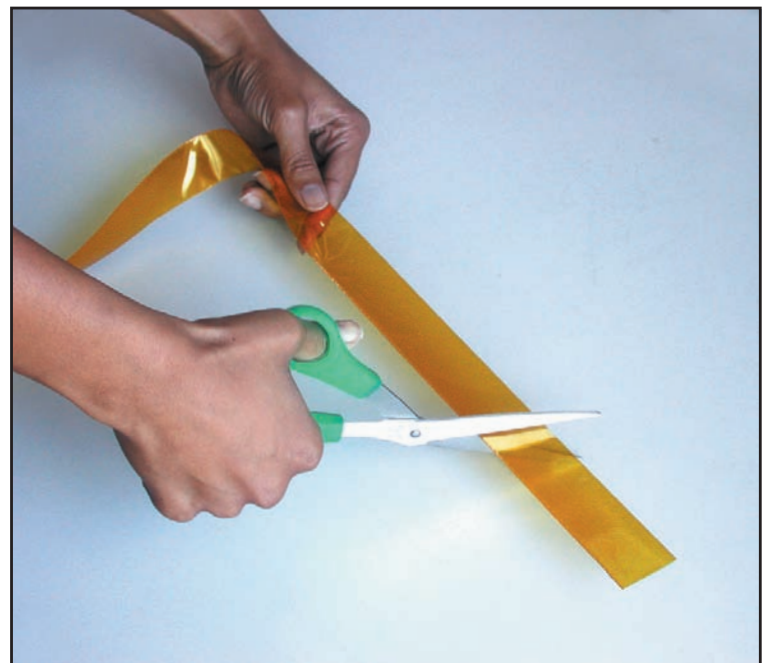


With GAMColor® protection



Without GAMColor® protection
Artwork by Tamara Guion

GamTubes™

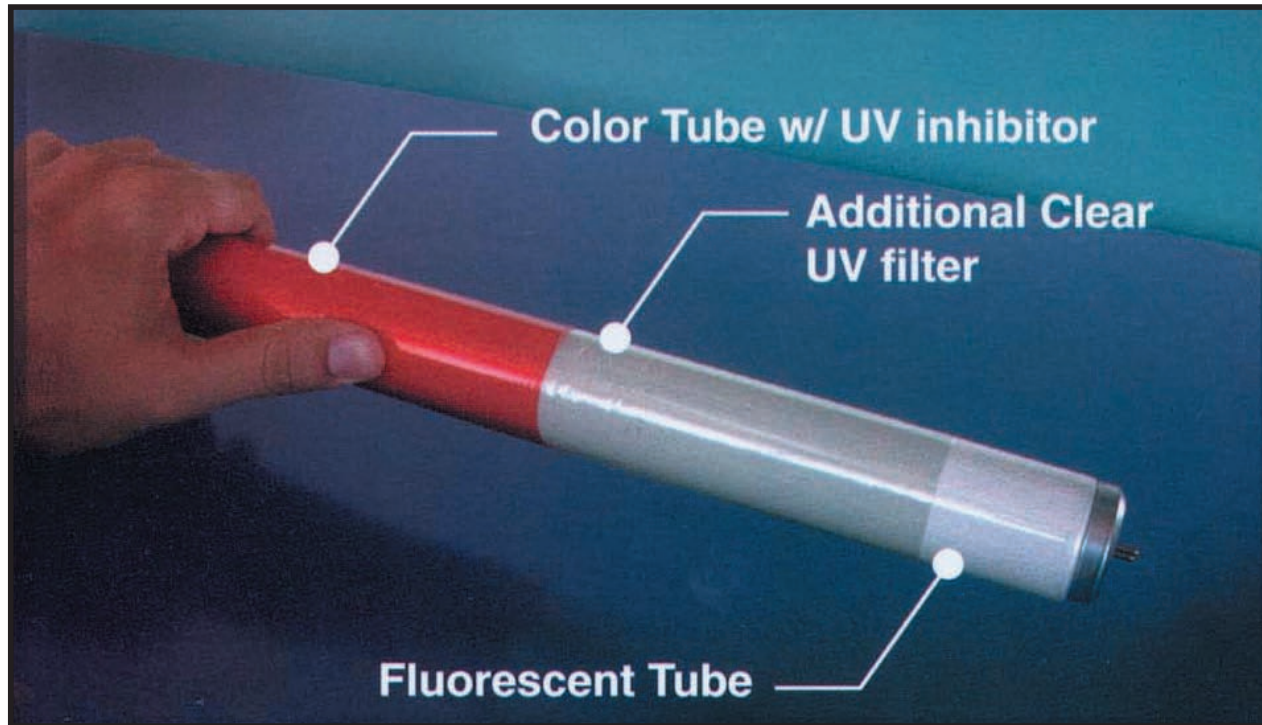


GAMTUBE™ Application

- Two UV filters in combination with one color filter applied to the Cellcom Building in Netanya, Israel
- GamTubes™ still performing after many years of use



SuperTube™



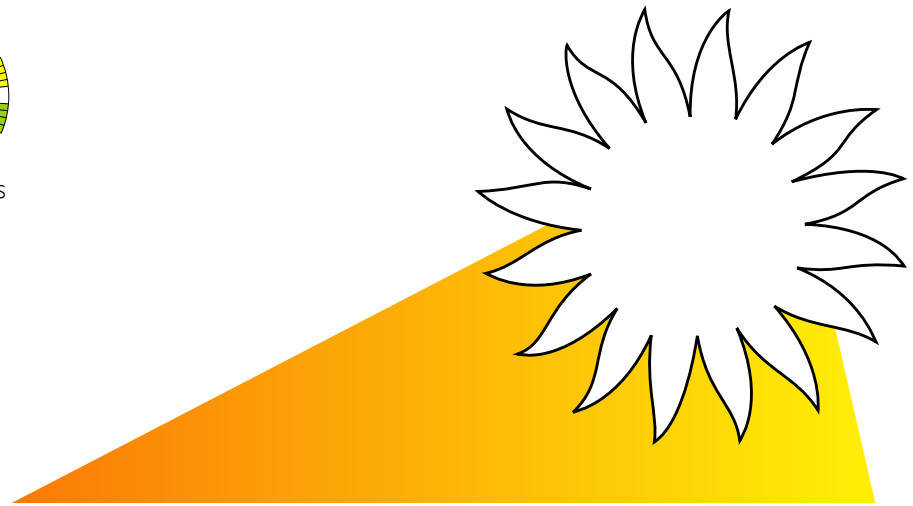
SuperTube™ is a GamTube™ with a first layer (closest to the lamp) of UV filter and a second layer of GamColor®. The UV filter helps to extend the color life expectancy by filtering out the high UV content of the fluorescent lamp. SuperTube™ effectively doubles the life expectancy of a standard GamTube™ in the same situation. In an installation where we would expect one year of color life, the SuperTube™ would double it to two years. SuperTube™ is recommended to minimize maintenance frequency.

Super/Supertube™ is a first layer of UV (closest to the lamp) a second layer of color and a third layer of UV filter. The first layer of UV is to protect the color from the high UV content of the fluorescent lamp. The outside layer of UV filter protects the color from the UV of the sunlight. Super/Supertube™ is recommended for outdoor fixtures exposed to sunlight. The Super/Supertube™ should be mounted within the enclosed fixture to protect it from the weather.

Summary of conditions for storage and display

BOOKS & PAPERS	STORAGE	DISPLAY
Temperature	18°-22°C (64°-71°F)	18°-22°C (64°-71°F)
Relative Humidity	30-50%RH	45-55%RH
Brightness of the Light	For all paper, dark storage is preferred. If the items are being used for research, the light should be kept as low as possible. The periods of exposure to light should be kept to a minimum as well.	Ideally should be no higher than 50 lux
UV Content of Light	Dark storage is preferred but if light is present, UV content should be no greater than 75 µW/lm, and preferably below 30 µW/lm.	No greater than 75 µW/lm, preferably below 30 µW/lm.
PAINTINGS	STORAGE	DISPLAY
Temperature	18°-22°C (64°-71°F)	18°-22°C (64°-71°F)
Relative Humidity	30-50%RH	45-55%RH
Brightness of the Light	For all paper, dark storage is preferred. If the items are being used for research, the light should be kept as low as possible. The periods of exposure to light should be kept to a minimum as well.	Ideally should be no higher than 250 lux.
UV Content of Light	Dark storage is preferred but if light is present, UV content should be no greater than 75 µW/lm, and preferably below 30 µW/lm.	No greater than 75 µW/lm, preferably below 30 µW/lm.
PHOTOGRAPHS	STORAGE	DISPLAY
Temperature	18°C±4°C (64°)	21°C±4°C (70°)
Relative Humidity	30-50%RH	30-50%RH
Brightness of the Light	Dark storage is preferred	Less than 250 lux
UV Content of Light	NA	Less than 30 µW/lm and no greater than 75 µW/lm.

¹ Heritage Collections Council Secretariat, GPO Box 2154, Canberra ACT 2601: *ReCollections : caring for collections across Australia / Heritage Collections Council.* (Australia, Canberra, A.C.T. : Heritage Collections Council, c1998), 31, 67,109.



UV RADIATION AND LIGHT

Thank you for your attention

UVA

UVB

UVC