



The Facts About Ultraviolet Radiation and Fading

The sun is 93 million miles away from the earth. Radiation from this distant source, including Ultraviolet (UV) radiation, enters homes through windows. UV radiation may increase the fading of furniture, carpets, draperies, and artwork.

The Sun's Role in Fading

Solar radiation is the main cause of fading. The sun's energy is made up of three distinct parts – UV, visible, and infrared radiation. While visible light, artificial light, heat, humidity, age of fabrics, and fabric dyes all play a part in fading, UV radiation is responsible for about 40-60 percent of the damage.

Protecting against UV radiation is important in all types of climates, whether sunny and warm, or cloudy and cold.

The Causes of Fading

Fading is a change in color over time. Often it is a loss of color or a reduction in color saturation due to bleaching. A number of different factors contribute to fading of fabric and other products.

One is the chemical changes in the coloring agents of a given material. Such changes can be triggered by several factors including the:

- Type of coloring agent/chemical
- Chemical environment of each coloring agent
- Ambient chemical environment of the material (e.g., temperature, humidity, radiation)
- Interior location and lighting (primarily fluorescent)
- Variations of all of these factors over time

UV Radiation and Windows

Although invisible to the human eye, UV radiation enters a home through its windows.

Clear, single-pane glass reflects about 25 percent of the sun's UV radiation while insulating glass reflects up to 40 percent. Using low-e coated glass provides additional protection, reflecting up to 74 percent.

Some window film products and laminated glass products can block up to 99 percent of UV radiation.

Window film is the combination of a form of transparent plastic and an adhesive, which creates a light, reflective covering for windows. Window films are available for both commercial and residential use. These films provide a nearly invisible barrier.

Laminated glass has an inner layer of film sandwiched between two window panes (similar to the glass used on a car's windshield). This gives windows the strength needed to stand up to impacts caused by storms. It also filters the sun's light, admitting the desirable, visible radiation and blocking harmful, invisible UV radiation.

Questions?

NFRC is here to support you.
Please contact us for additional information.

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How to Reduce Fading

Window selection can have a profound impact on the type and intensity of UV radiation transmitted into homes.

In an effort to prevent fading, many homeowners install lined curtains, draperies, shutters, tinted or reflective glass, or dark "stick-on" window films. While any one of these products can reduce fading, there are downsides. They can prevent light from passing freely through the window, offsetting the value of having windows in the first place.

Furthermore, curtains, draperies, and shutters all require the resident to operate them regularly and some tinted glass and films drastically change the appearance of windows, both inside and out.

Energy-efficient windows and doors can also reflect harmful UV rays. For example windows and doors with low-e glass reflect the majority of UV radiation. The low-e coating on glass both absorbs and reflects part of the sun's radiation (the reflected portion goes back into the outdoors), while allowing the transmittance of important visible light into the house.

Shedding New Light on Fading

When it comes to UV radiation what can't be seen can still have an adverse impact on building occupants and valuables.

That's why fading has emerged as a major concern for home and architectural projects. It's not just because people want to protect their carpets, drapes, and furnishings while preventing precious photographs and artwork from becoming faded memories. It's also because of the widespread concern of UV radiation as a health hazard.

It is important for architects, window manufacturers, and consumers to be aware of the latest and most comprehensive performance measures available.

The growing number of windows used in construction projects, less stable fabric dyes, and interior finishes, combined with higher levels of UV radiation, are all factors driving people to seek alternatives to reduce UV radiation. The glass industry has responded to this concern with many new technologies that provide considerable protection against potentially severe fading while maximizing other performance features.

Measuring Fading

Fading is measured by evaluating the color of a material at two or more points in time.

It is extremely difficult to isolate how solar radiation causes fading. The best currently available indication on the effect of radiation transmitted by a glazing system on fading is provided by the damage-weighted transmittance (also shown as Tdw) of the glazing system.

Tdw is a weighted transmittance for the center-of-glass of a window. The calculation is based on studies of art materials, not furnishings or construction materials, so its applicability to those materials is unknown.



FOR MORE INFORMATION

NFRC has additional information about selecting energy-efficient windows on its Web site: at www.nfrc.org. The site includes the NFRC Certified Products Directory, which lists hundreds of window manufacturers and thousands of windows, doors, and skylights that have been authorized for certification by NFRC. If you need further information, please contact NFRC at 301-589-1776.

TECHNICAL RESOURCES:

For technical measurement information, refer to NFRC 300 - *Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems*.

Florida Solar Energy Center also has information on fading posted on its Web site at: <http://www.fsec.ucf.edu/en/consumer/buildings/basics/windows/fading.htm>.