

## Iridescence Effect in Window Films

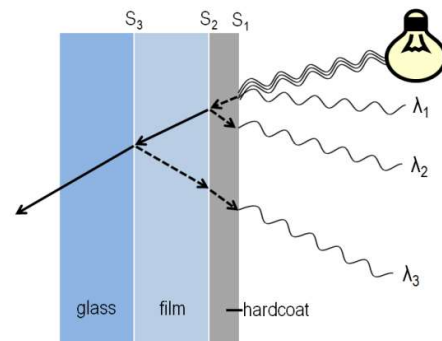
Under certain lighting conditions and viewing angles, window films can, at times, exhibit a “rainbow effect” or an “oil on water” appearance on the surface, referred to as **iridescence** (Figure 1). The coloration is not from dyes or other color substances rather it is due to the multilayer structure of window films. Iridescence manifests as varied colors and is the result from the interference of light waves reflected from different surfaces within the film, and changes with the angle of view. In the case of window films, the scratch resistant hardcoat (surface 1) applied over the polyester film (surface 2) is responsible for the iridescence. While the hardcoat is optically clear, it has a slightly different refractive index than the underlying polyester film. As depicted in Figure 2, when incident light hits the hardcoat (i.e., light from the interior of the room), some of the light transmits through to the exterior of the window and some of the light is reflected off the hardcoat and back into the interior of the room ( $\lambda_1$ ). Additionally, light is reflected off the underlying polyester layer and back again through the hardcoat ( $\lambda_2$ ). Variations in the reflected light waves across the surfaces of the film produce the iridescence effect.

The most common source of iridescence is artificial lighting, particularly fluorescent lighting. Fluorescent light emits discrete wavelengths of light instead of a continuous spectrum of light which can make the iridescence appear much worse. Also, iridescence can be amplified under certain viewing conditions, such as with darker external backgrounds like nighttime and with sloped glass. The best way to reduce iridescence is to use a full spectrum light source like incandescent lighting or full spectrum LED lighting.

Iridescence is not a sign of product failure or deterioration.



**Figure 1.** Iridescence (seen in this image as multicolored streaks running horizontally) on film under fluorescent lighting. Image altered to accentuate



**Figure 2.** Light passes through different media and reflects back at different wavelengths, causing

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