datacolor

How to use Contrast Ratio as a measure of Translucency

Light can interact with an object in a variety of ways. Light can enter into an object and pass through it. It can be refracted at the interfaces of its surfaces, and be scattered. It can be absorbed and reflected by the materials that make up the composition of the object.

When light passes through an object in fairly straight manner, you can see through it clearly and distinctly, it is said to be ***transparent***. If the material is colorless, all the light is transmitted. If the object contains materials that absorb but do not scatter light, it will appeared to be colored.

If the object allows no light to be transmitted, it is said to be ***opaque***.

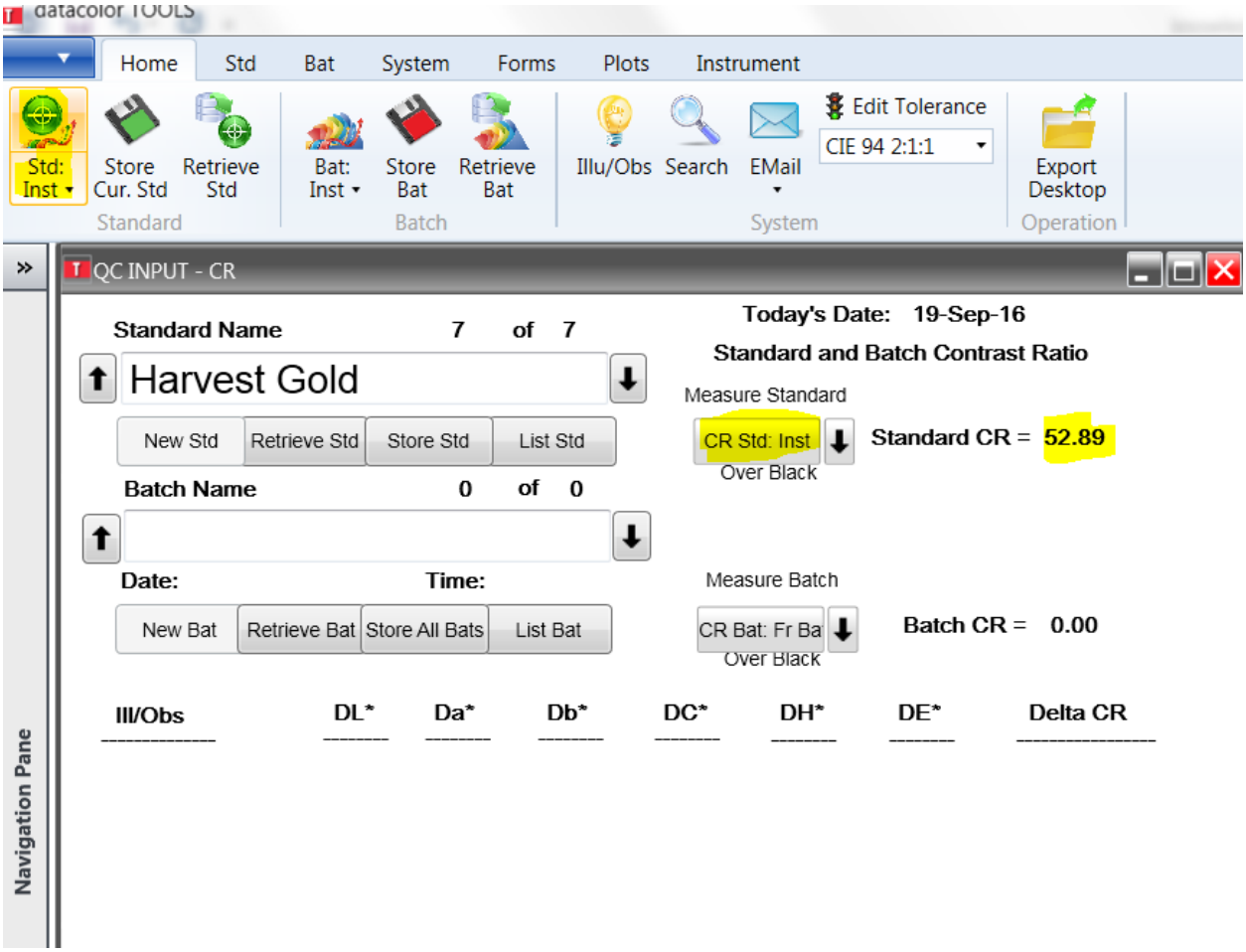
If the objects allows only some of the light to be transmitted, it is said to be ***translucent***.

In all three cases, there is some light scattered at the surfaces or interfaces due to refraction.

Translucency varies from being nearly transparent to nearly opaque. It is dependent on the composition of the object, its thickness, and the intensity of the light striking it. For example, the uncolored plastic material polyethylene is used to make the protective bags put over your garments by the dry cleaner. It has an extremely small film thickness and appears to be transparent. That same uncolored polyethylene used to make a gallon jug for your milk allow only some of the light to pass through, it appears to be hazy and white and you can see the level of milk in the jug. This would be translucent.

Your Datacolor spectrophotometer can be used in reflectance mode to measure translucency in a scale called Contrast Ratio, or CR. It is a scale that is calculated up to a value of 100 which would be opaque, with the values going down from there being increasingly translucent.

Contrast ratio measurement can be performed by measuring your object twice: once over a white or light background and then again over a black or a dark background. This is illustrated in the image below. This was done with a calibrated spectrophotometer, measuring in reflectance and the Datacolor Tools QC screen form QC Input -CR



The sample placed at the aperture plate of the spectro and backed up by a white background. The Standard measurement button, Std Inst, in Home ribbon bar above was used for this measurement. The white background was then replaced with a black background and a measurement was taken of the same spot on the standard using the button embedded in screen form, CR Std:Inst. The Contrast Ratio then was display as Standard CR = 52.89.

This was done with a solid object. For some materials, such as paint, coatings, inks, etc., the object is a liquid material drawn down across the surface of a white and black cardboard card or paper. This is done giving a uniform film thickness to the material being applied. Once it is cured or dried, it can then be measured in a similar manner with the exception of the site of the measurement. On the solid object, we measured the same site on the object, over white and then over black. In the case of a drawdown, we would measure the applied film over the white area of the card and then the applied film over the black area of the card.

Contrast ratio is calculated using this equation: CR = (Yod/Yow) x 100 where Yod is the CIE tristimulus value Y calculated for the measurement of the sample over the black or dark

background and the Yow is CIE tristimulus value calculated for the measurement of the sample over the white or light background.

Since we are calculating the CIE tristimulus value from the reflectance x the illuminant's spectral energy x the standard observer data, it needs to be noted here that changing the illuminant and/or the observer table data being used (e.g., D65/10 vs. A/10 vs. C/2) may very well change the calculated CR, as would changing the spectrophotometer setup (e.g., large area view vs. small area view, specular include vs. specular excluded).

Additionally, it is recommended that the contrasting background material be in intimate contact with the sample being measured, eliminating, or at least decreasing as much as possible, any gap (usually air) between the two surfaces.