



Glossary of Terms for Color and Appearance

Angle of Incidence

Definition

The angle between a ray of light and a line perpendicular to an object's surface.

Example

The angle of incidence of a ray of light arriving perpendicular to an object's surface is zero degrees. A standard configuration for observing the visual color difference between objects is with an angle of incidence of 45 degrees and an angle of view of zero degrees.

Angle of Reflectance

Definition

The angle between a ray of light reflected from an object's surface and a line perpendicular to that surface.

Example

The angle of reflectance of a ray of light always equals the angle of incidence. A ray of light arriving at an angle of incidence of 30 degrees from a line perpendicular to a surface will have an angle of reflectance of 30 degrees away from the same perpendicular line.

Angle of View

Definition

The angle between the axis of observation and a line perpendicular to an object's surface.

Example

In order to reproducibly observe the color of an object or the color difference between objects, one should control the background, the illuminant, the angle of incidence, and the angle of view. A standard configuration for observing the visual color difference between objects is with an angle of incidence of 45 degrees and an angle of view of zero degrees.

Chroma

Definition

The magnitude of the difference between a color and a gray of equal lightness. In common usage, sometimes referred to as the “brightness” of a color.

Example

Increasing the “Color” setting on a television increases the chroma of the images, even to a level not found in nature. Decreasing the setting will eventually produce a black and white image, of the same lightness, but with no chroma at all, or “achromatic”.

Clarity

Definition

A property of transparency by which images or objects distant from a transparent material can be clearly observed through the material.

Example

Clear glass is transparent; objects can be seen through the glass with clarity.

Color Constancy

Definition

The degree to which a perceived color changes under different illuminants or viewing conditions.

Example

The car looked gray in the showroom but appeared blue on the lot.

Color Reference Standards

Definition

A precisely controlled set of color samples, used to produce and verify color matches and communicate color targets.

Example

Some common examples of color reference standards would include those produced by color design companies (e.g. Pantone, RAL, or NCS, etc.) and those produced by paint companies (e.g. Sherwin Williams, PPG, Benjamin Moore, etc.). If someone would refer to a specific color designation from one of these systems, then someone else could refer to that color chart or book and observe the same color.

Color Travel

See Flop

Contrast Ratio

Definition

A measure of opacity. The ratio of light reflected by a film covering a standard black background to the light reflected by the film covering a standard white background

Example

As an object's contrast ratio approaches 100%, it nears complete opacity, at which point there is no difference in its appearance whether it is placed in front of a white or black background.

Dichroism

Definition

A special case of iridescence, occurring when a material splits the visible light from one source into distinct beams of different colors. This effect can be generated by depositing thin layers of varying refractive indices onto the surface of a glass object, by the use of dichroic pigments, or by other means.

Example

Dichroic glass is produced by depositing very thin layers of oxide onto a glass surface, which results in hue changes with varying angles of incidence or view.

Diffusion

Definition

Scattering or dispersing of rays of light, in either reflection or transmission, such that transmitted or reflected images are blurred, partially obscured or lose definition. The tendency to eliminate a direct beam of light, without changing its color.

Example

A frosted, sandblasted, or etched pane of glass can serve as a privacy partition due to its high diffusion.

Distinctness of Image (DOI)

Definition

The clarity or sharpness of images produced by an object's surface reflection. Affected by gloss, distortion and diffusion.

Example

Enameled glass with a gloss value of 70 would likely have a greater DOI than an enameled glass with a gloss value of 40. DOI is of high importance in mirrors, where the image should be reflected with very little distortion.

Distortion

Definition

A non-uniformity in glass which causes a reflected or transmitted image of an object to vary from the object's true shape.

Example

Examples of glass with optical distortion include “fun house” mirrors, patterned glass, and heat-treated glass.

Etch

Definition

Proposed: Generic term used to describe the appearance of glass that has been modified in such a way to provide a surface that will diffuse transmitted light, reduce glare and have a frosted appearance. Etched glass may have different levels of transparency, either uniformly over the entire surface or in selected areas to create decorative patterns.

Example

Etched glass can be used to reduce glare or provide a frosted appearance.

Flop

Definition

The phenomenon whereby a perceived color will change according to the relative position of the surface, the illuminant, and the observer. Also known as “Color travel”.

Example

A pearlescent finish on an automobile will often shift in color depending on its angle relative to the observer and the sun. As a result, prominent color highlights can be achieved through bends and creases in the body panels.

Fluorescence

Definition

The phenomenon whereby an object will absorb light at one set of wavelengths and re-emit this light at a set of longer wavelengths.

Example

The novelty item glowed under a blacklight, due to fluorescence from the ultraviolet into the visible range of light.

Gloss

Definition

The amount of reflected light relative to the amount of incident light from a surface at a given angle. Gloss is measured at an angle equal to that of the incident light and relative to a standard of known gloss.

Example

The latex paint was available in numerous gloss levels:

<10	Matte
10-25	Eggshell
25-35	Satin
35-70	Semi-gloss
70-85	Traditional Gloss
85-100+	High gloss

Haze

Definition

A reduction in the contrast of an image, whether viewed in reflection or transmission, caused by the scattering of light on or through a material.

As in Reflection: A cloudy or frosty appearance created by scattering of light at the surface.

As in Transmission: Contrast reduction of objects viewed through a specimen as a result of light scattering.

Example

Low-E coatings may cause a smoky-like haze appearance in direct sunlight. Haze can be used to soften a transmitted image of an object and can be created with laminates or surface modifications.

Hue

Definition

The perceptual element of color that differentiates between colors such as blue, red, yellow and green. In common usage, sometimes referred to as “color shade”.

Example

The green of a freshly cut lawn or the rind of a lime are different hues in the green color family.

Illuminant

Definition

Light of a specific spectral distribution. An illuminant may be from an actual source, for example a particular light bulb, or may be of an idealized distribution. An illuminant is specified as part of the viewing conditions or spectrophotometric parameters for measuring color.

Example

There are a number of standard illuminants, such as A, B, C, D, E and F, representing incandescent, direct sunlight, general daylight, phases of daylight, equal-energy illuminant, and idealized fluorescent, respectively. Objects may appear different in color depending on the illuminant (see Metamerism or Color Constancy).

Iridescence

Definition

An optical phenomenon in which hue changes with the angle from which a surface is viewed. Iridescent colors are often caused by interference of light waves as they pass through semi-transparent layers of materials.

Example

Butterfly wings, soap bubbles, and dichroic glass exhibit the shifting colors of iridescence.

Lightness

Definition

The perceptual quality of color corresponding to the difference between white (lightness), black (darkness), and the intermediate stages of grays. It is also applicable to non-neutral colors.

Example

For example, a particular sky blue may have an L^* of 81 whereas a navy blue may have an L^* of 25. A typical lightness scale (for example, L^*) ranges from 0 (perfect black) to 100 (perfect white).

Metamerism

Definition

The phenomenon whereby the perceived color of two surfaces match under one illuminant, but do not match under a different illuminant.

Example

The necktie matched the suit at home, under incandescent lighting, but outside, they no longer matched (under sunlight).

Opacity

Definition

The degree to which an object hides a pattern or surface directly behind it. In common usage, sometimes referred to as “hiding”.

Example

Spandrel glass is designed to have high opacity, in order to hide the area behind it.

Optical Distortion

See Distortion

Pigment

Definition

Colored powders which add color, body and opacity to coatings and other materials.

Example

A sky blue can be made by combining a cobalt blue pigment with a titanium white pigment.

Reflectance

Definition

The ratio of reflected light to incident light. In common usage, sometimes referred to as “shine” or “glare”.

Example

When the face of a watch catches the sun, a spot of light is cast due to the high reflectance of the crystal of the watch.

Sandblasted Finish

Definition

A frosted or etched appearance, produced by using high velocity air to spray a stream of hard, abrasive particles against one or more glass surfaces. The effect is to increase obscurity and diffusion.

Example

Privacy glass that transmits light but obscures background objects often employs highly scattering surfaces, such as sandblasted finishes.

Satin Etch

See Etch

Saturation

Definition

The perceptual element of color that differentiates between a color and a neutral shade. Related to chroma, but expressed as a range from the neutral shade (0%) and a fully saturated shade (100%).

Example

Most display devices can be adjusted to have a saturation level from zero (black and white) to 100% (unnaturally bright). Realistic images require an intermediate saturation.

Scattering

Definition

The phenomenon of light being redirected over various ranges of angles upon passing through a material.

Example

Most pigments are crystalline in structure, having multiple facets which reflect light at various angles, thereby scattering it.

Spectrophotometer

Definition

An instrument for measuring the intensity of reflected or transmitted light across a range of wavelengths. It is typically used for quantifying the color of an object or color differences between objects.

Example

A spectrophotometer can be used to verify that the color of an object is within acceptable tolerances to a target. It might also be used to automate color matching or check the color uniformity across a surface.

Translucency

Definition

The property of transmitting light diffusely but not allowing objects beyond a material to be viewed clearly.

Example

Etched glass is translucent; objects behind the glass may be seen but not clearly.

Transmittance

Definition

The ability of a glass object to pass radiant energy (light and/or heat), usually expressed in percentages (visible transmittance, thermal transmittance, etc.).

Example

Glass can have a broad range of visible transmittance, ranging from very high, in the case of photography lenses and low-iron float glass, to very low, such as tinted or coated grades.



Transparency

Definition

A property of transmitting light with minimal diffusion, characterized by the clarity of which objects may be viewed through a material.

Example

Spandrel glass is highly opaque to hide the interior behind it, it has virtually no transparency.

Visible Light Reflectance

Definition

The percentage of visible light (approximately 400-750 nanometers) within the solar spectrum that is reflected from a surface.

Example

Glass can have a high visible light reflectance (e.g. mirrored or silvered glass or coated reflective glass) or a low visible light reflectance (anti-glare or etched glass).

Visible Light Transmittance

Definition

The percentage of visible light (approximately 400-750 nanometers) within the solar spectrum that is transmitted through a material.

Example

Glass can have a broad range of visible transmittance, ranging from very high, in the case of photography lenses and low-iron float glass, to very low, such as tinted or coated grades.

Whiteness

Definition

The perceptual element of color that distinguishes how close an object comes to pure white. In common terms, sometimes referred to as brightness.

Example

Consider two grades of copy paper, one new and the other recycled. Both are white, however when compared side by side the new paper may have a higher whiteness and will appear brighter.

Yellowness

Definition

The perceptual element of color that distinguishes the departure of a colorless or white object to a yellow.

Example

Old newsprint, much-worn white clothing and aged photographs have a greater yellowness than their new counterparts.



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