

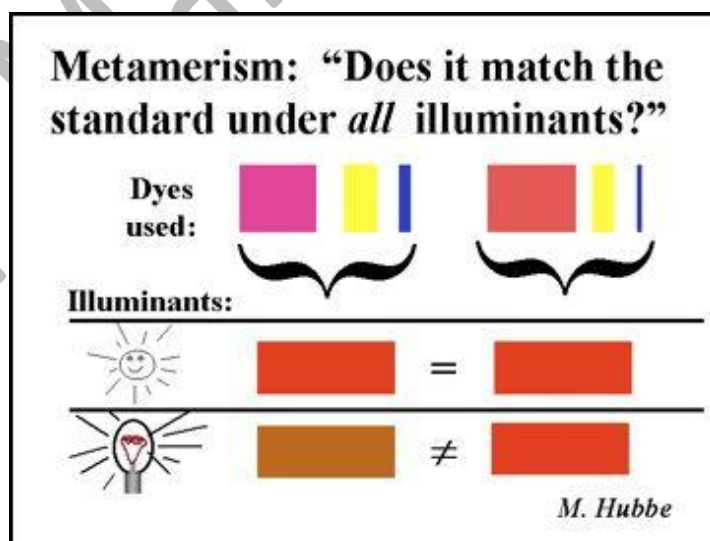
Metamerism



Metamerism is a phenomenon, in which **two colors appear the same** under one light source but **different under another**. This property of a **pair** of objects is known as **metamerism**.

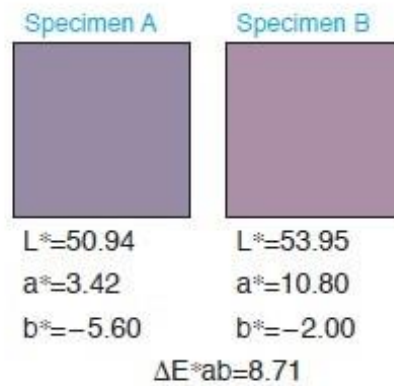
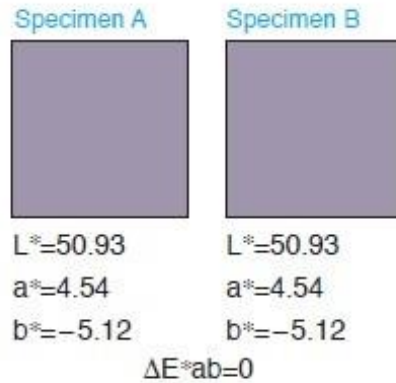
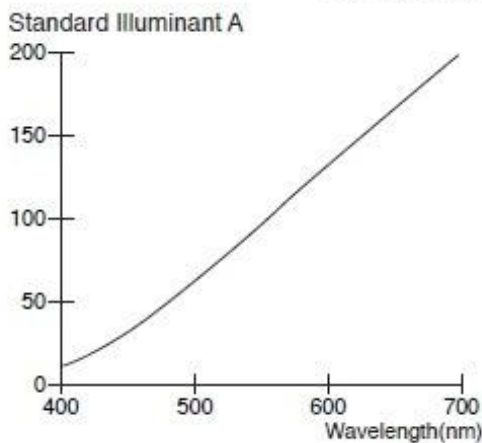
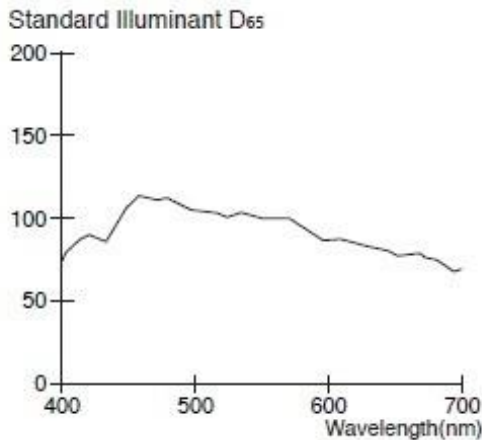
Light source metamerism is the most **notorious**, but there is a wider range of circumstances. Metamerism is **rare in nature** but they are more **common in synthetic colorant mixture**.

Causes of Metamerism



Metamerism primarily occurs due to **differences in spectral power distributions (SPD)** of light sources and the **spectral reflectance properties** of the surfaces of

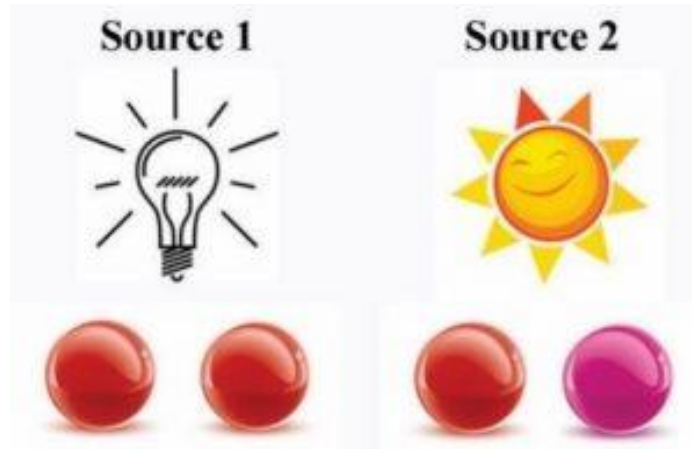
objects. Our perception of color relies on the **interaction between light and the surfaces of objects**. When **two objects reflect light** in a **similar manner** across the visible spectrum, they may appear as the same color, even though their **actual spectral reflectance curves differ**.



Types of Metamerism

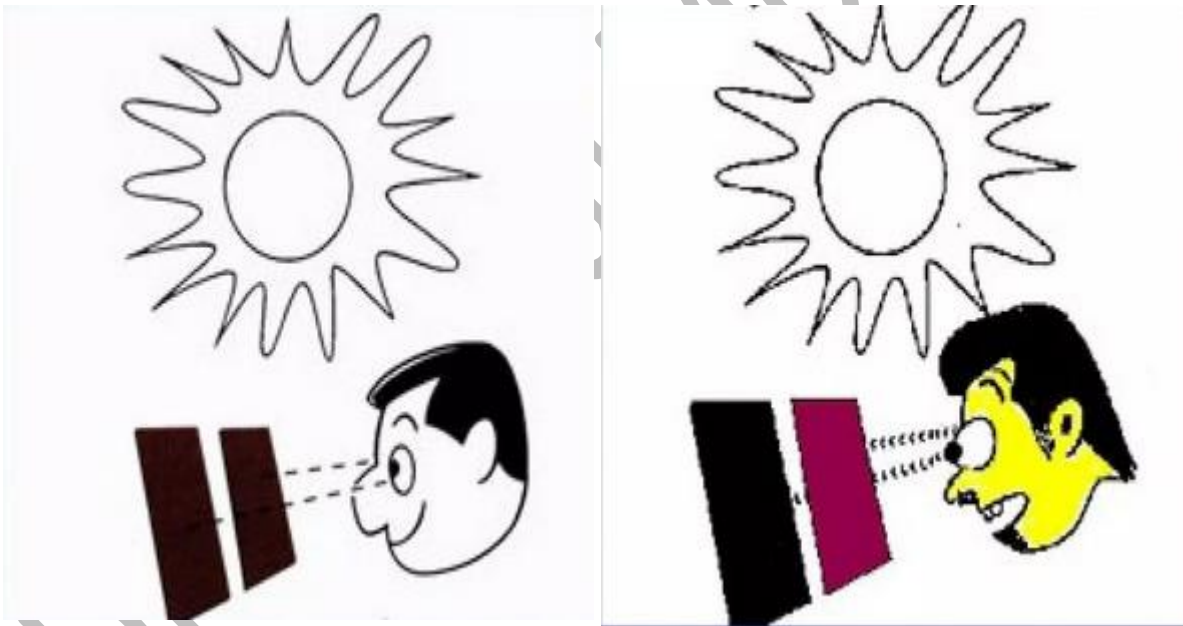
1) Illuminant Metamerism

This is the well-known type of metamerism; **two colors appearing similar** under **one light source** and appearing **different under another light source**. In **normal day light** it may show **no notable effect**, whereas if looks under an **UV emitting light source** some parts will **light up** due to the **use of optical brighteners**.



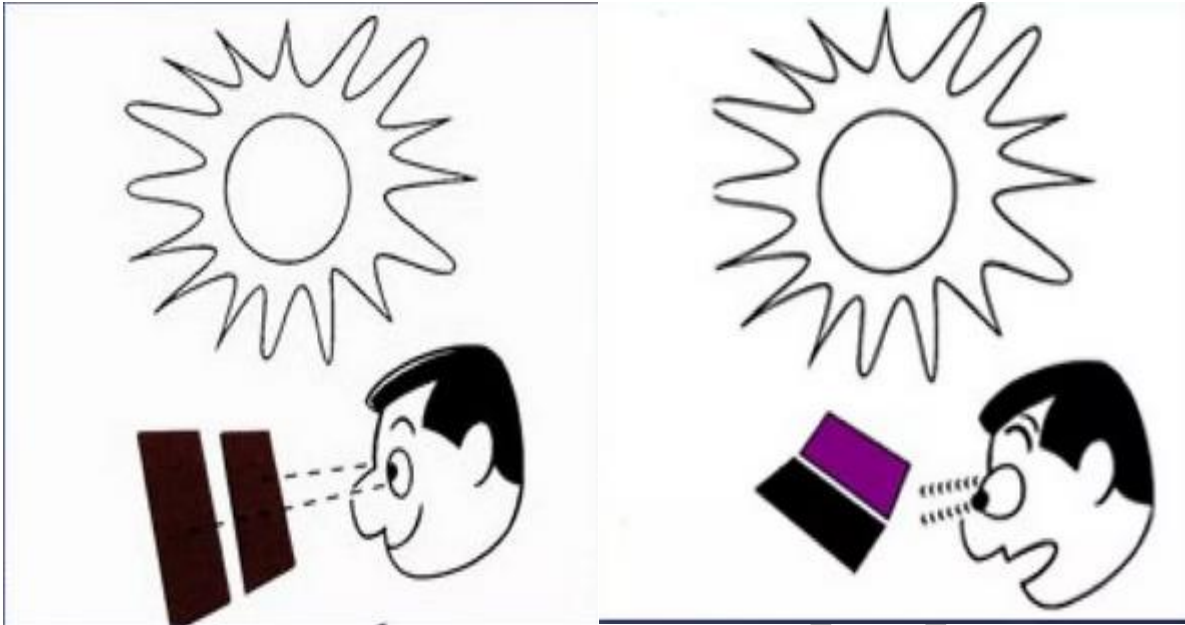
2) Observer Metamerism

It is caused by a **difference in color vision** between **2 observers**; it is highly subjective and cannot always be avoided. However, by **proper selection and training** of colorists the risk can be reduced.



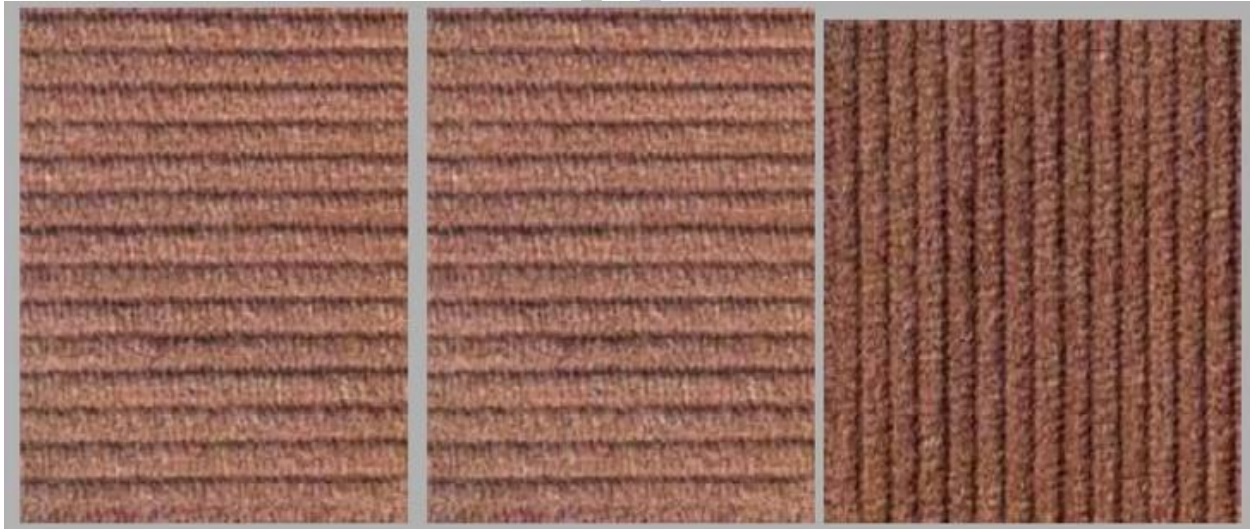
3) Angular Metamerism

When **an observer** looks at 2 samples in **same light sources**, but the color **may differ** often **on the angle** observer look at it.



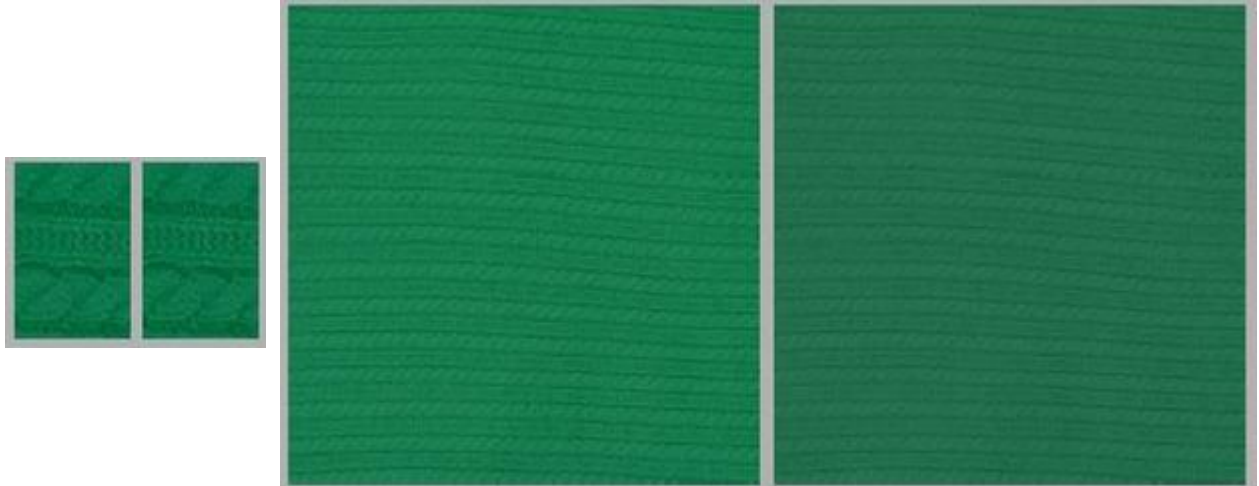
4) Geometric Metamerism

This occurs when **two samples match** in one **direction** but **no longer match** when the samples **directions are changed**.



5) Field Size Metamerism

It occurs when **two small samples appear to match** but equivalent **larger samples no longer match**.



How to Eliminate Metamerism?

Tools such as **Spectrophotometers** and **Color Matching Boxes** can be used to **eliminate Metamerism** as they provide **different light sources**, including **daylight, fluorescent, incandescent, and LED**. By providing **consistent illumination** across different **spectral distributions**, these tools enable **precise color analysis and matching** across diverse **lighting environments**, helping to **identify potential metamerism issues and optimize color reproduction**.

List of Artificial Illuminants

- **D65**: A CIE standard illuminant that **represents daylight** near noon.
- **TL84**: Europe and Japan Shop Light Source.
- **UV**: UV light.
- **F/A**: Sunset Light.
- **D50**: A light source used in color matching boxes that **represents noon daylight**.
- **D75**: A **bluish light source** that emphasizes **blue and subdues green and red**. It is derived from the light coming in a **north facing window** in the **northern hemisphere** at noon.