

Metamerism Index

Background

Metamerism exists when two materials match under some lighting conditions but not under other lighting conditions. This can be a serious problem for manufacturers who combine various parts of different materials or materials from different sources into one product. A customer expects all the parts of a car that are the same color to match whether it is a sunny or cloudy day. Someone who buys a coordinated outfit expects the jacket and slacks to match in daylight as well as under the fluorescent lights of the department store.

Metamerism index is a single-number index which indicates how well two materials that match under one illuminant will match under another illuminant. Typically, CIE Illuminant D₆₅ is the reference illuminant and the test illuminant is one chosen depending on the end use of the material. For example, CIE Illuminant F2 may be chosen as the test illuminant for cloth going into garments that will be displayed in department stores lit with fluorescent lights. This index is described in CIE Publication 15.2 (1986), Section 5.2.

For this index to be meaningful, the materials should be a good match under the reference illuminant. Using HunterLab instruments, any two illuminants may be chosen for calculating metamerism index. The metamerism index calculation is based on Hunter L, a, b values.

Conditions for Measurement

Instrumental: Any HunterLab spectrophotometer

Illuminants: Any

Standard Observer Function: 2 or 10 degree

Transmittance and/or Reflectance: Either.

Formulas

$$MI = \sqrt{(\Delta L_{n1} - \Delta L_{n2})^2 + (\Delta a_{n1} - \Delta a_{n2})^2 + (\Delta b_{n1} - \Delta b_{n2})^2}$$

where n1 is the first illuminant, n2 is the second illuminant, and $\Delta = \text{Value}_{\text{sample}} - \text{Value}_{\text{standard}}$.

Typical Applications

This index can be used to measure any material for any industry in which non-metameric matches are important.

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