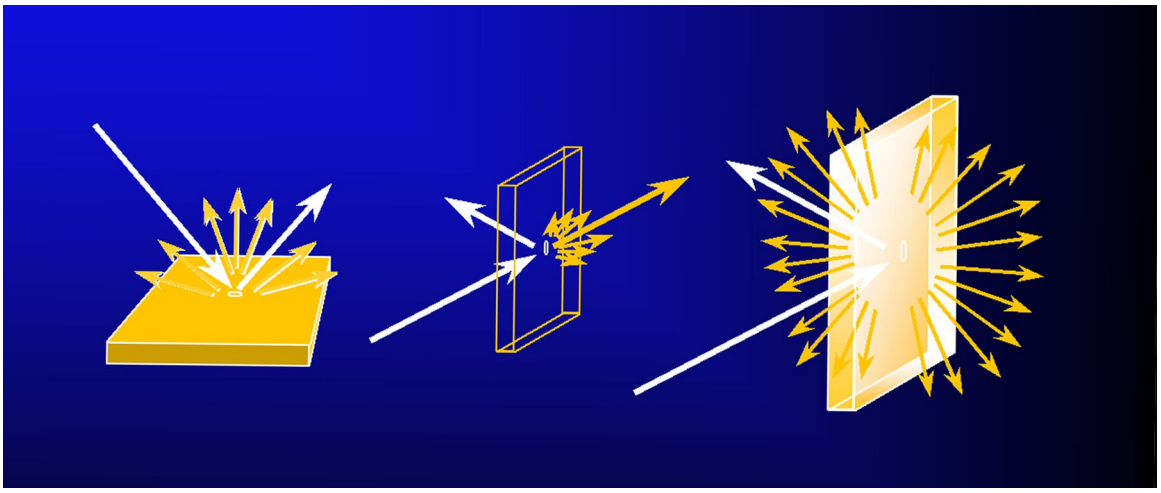
Applications Note

Insight on Color **Vol. 18, No. 2**

Measuring Transparent Samples Using a Reflectance Instrument

When the color of an opaque sample is measured, the source light hits the surface of the sample and is reflected back from it to the instrument's detector. When the color of a transparent sample is measured, the source light passes through the sample to reach the instrument's detector. Translucent samples both reflect and transmit light, which is what makes them more complex to measure.

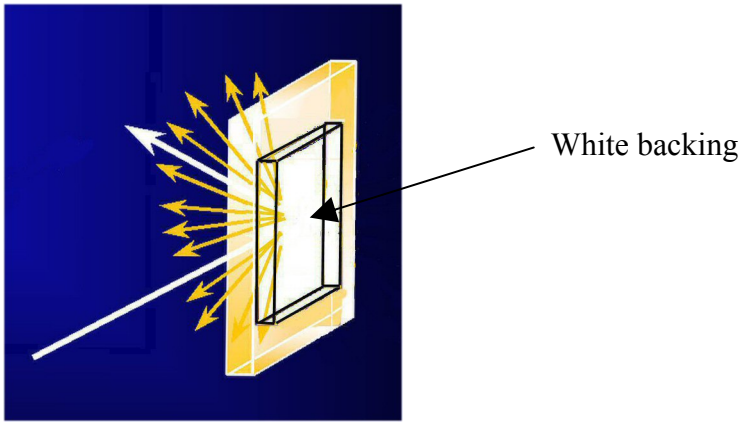


Light interactions for an opaque sample (left), transparent sample (center) and translucent sample (right). The specular reflection is shown in white with color shown in yellow.

The color of a transparent sample is typically measured in a transmission mode (with the sample held between the light source and the detector) using a benchtop sphere instrument, such as a ColorQuest XE, ColorQuest XT, UltraScan PRO, or UltraScan VIS. This method is recommended as the most scientifically sound one.

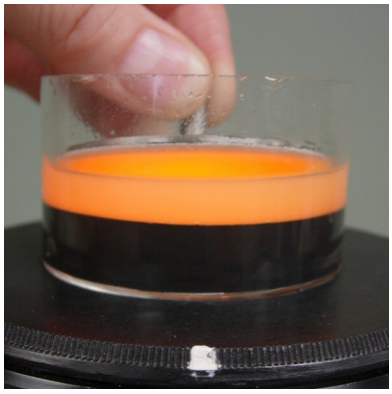
But what if the need to measure a transparent sample arises and you only have access to a spectrophotometer with a 45°/0° or 0°/45° geometry (such as a ColorFlex 45/0 or LabScan XE)? Do you need to buy a new instrument in order to read these samples? Not necessarily.

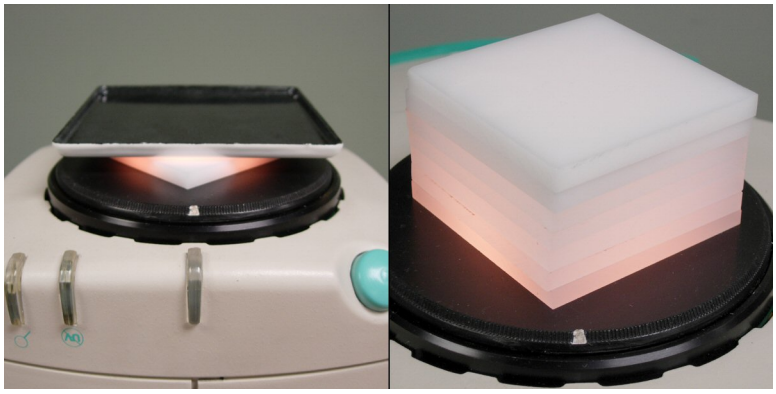
While not the optimal method, these samples can be measured in reflectance with a white backing, a method which uses a reflectance-only instrument to measure the sample as in the picture shown below.



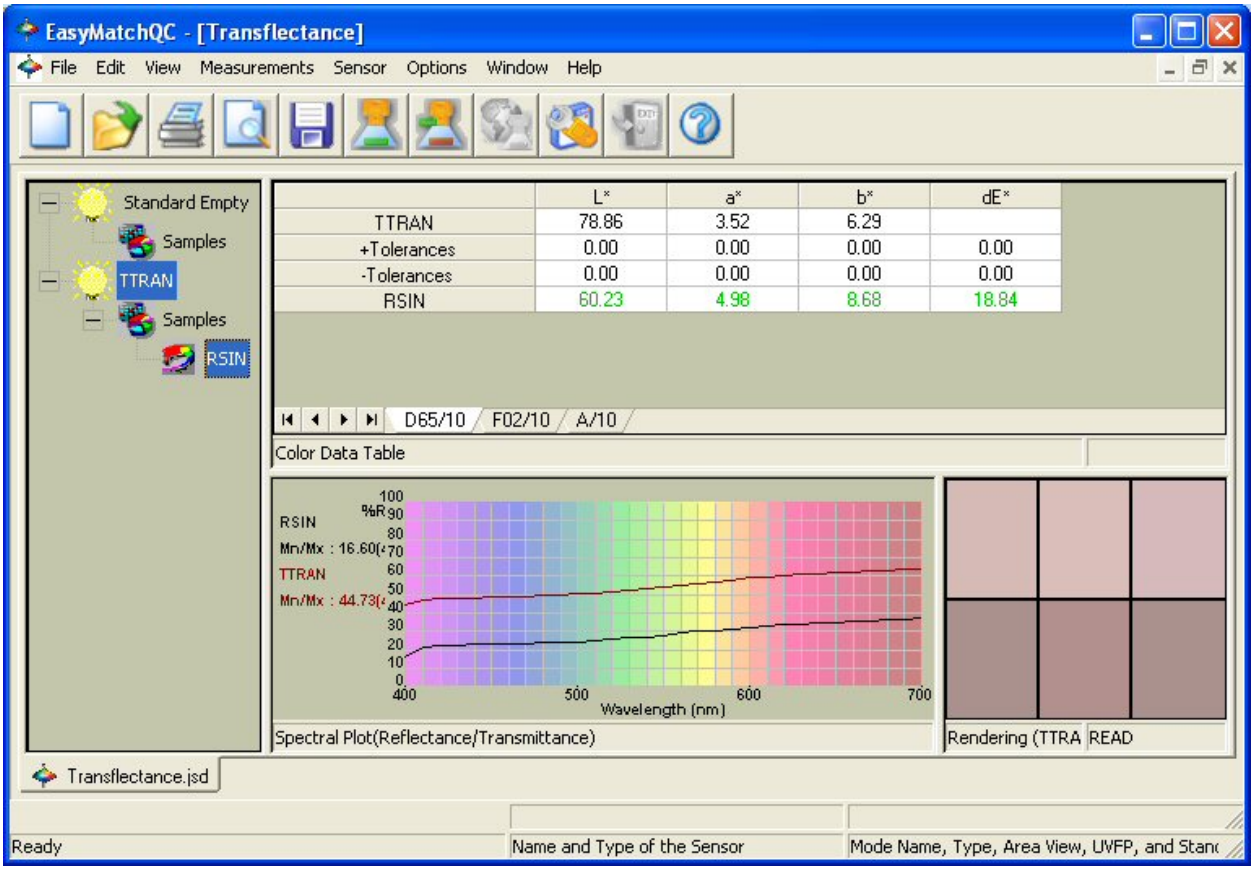
Light interactions for a transparent sample measured in reflectance

Back the sample with a constant white backing such as an extra white tile or, for liquids, white disk. The source light passes through the sample. The sample absorbs the wavelengths of light that it normally does, passing the rest of the light to the white backing. That light reflects off the white backing and returns through the sample to the instrument's detector. This method can also be used for the measurement of translucent samples such as those shown below. Please note that a consistent path length, or thickness, of sample should be established and used when measuring a particular type of sample.





As an example, a tinted glass sample was measured twice on a ColorQuest XE, the first time in TTRAN mode, and the second time in RSIN mode backed with a white tile. As you can see from the software screen shown below, the TTRAN measurement is lighter (higher L*) and less saturated (lower a* and b*) than the RSIN measurement, but the shapes of the two spectral curves are identical. As long as all samples of this type that are measured in reflectance are backed with the same white backing, the measurements can be used and compared in assessing color.



For Additional Information Contact:

Technical Services Department
Hunter Associates Laboratory, Inc.
11491 Sunset Hills Road
Reston, Virginia 20190
Telephone: 703-471-6870
FAX: 703-471-4237
www.hunterlab.com