

ASBC Beer Color and Turbidity

ASBC Color

The ASBC Beer Color scale has a range of approximately 1 to 11 units, with the more yellow, pale worts at the low end of the scale and the redder color of dark worts, beers and caramels at the upper end of the scale.

The industry reference method for ASBC Beer Color and Turbidity is:

ASBC Beer-10 Color of Beer Part A. Spectrophotometric Color Method available from ASBC – American Society of Brewing Chemists, affiliated with AACC – American Association of Cereal Chemists, St. Paul, MN USA www.scisoc.org/aacc.

The ASBC Color metric is based on a simple spectral absorbance (A) measurement at 430 nm of decarbonated beer using a 0.5-inch path length cell. The formula was originally defined as:

ASBC Beer Color = $10^{(A^{1/2})}$, 430 nm

In allow ASBC Beer Color to be measured and reported simultaneously using the same 10 mm cell path length cell that used to measure EBC Beer Color, a conversion factor of 1.27 is used to scale absorbance measured using a 10 mm path length cell to absorbance the original 0.5 inch path length cell.

$A^{1/2}$, 430 nm = $1.27 \cdot A_{10\text{mm}@430\text{nm}}$

The resultant ASBC Color formula when the sample is measured in a 10 mm path length cell becomes:

ASBC Beer Color = $10^{1.27 \cdot A_{10\text{mm}@430\text{nm}}}$

The instrument is typically standardized or blanked to 100% transmittance (absorbance = 2) on the cell filled with distilled water.

ASBC Turbidity

ASBC Turbidity is based on a simple spectral method that measures absorbance at two points – one in the blue (430-nm) and one in the red region (700-nm).

For the same reason that the sky is blue, scattering or turbidity in a liquid can be measured if the blue spectral absorbance is significantly different from the red absorbance.

If the absorbance is significantly different at these two points, then the ASBC Turbidity of decarbonated beer or similar liquid sample is rated as being “turbid”; if not then the rating is “free of turbidity”.

The test assumes the beer or wort solution has been decarbonated following guidelines in the ASBC Beer-10 Color of Beer method, and that any turbidity is caused by undissolved solids not removed by filtering.

For ASBC Turbidity, if the Absorbance at 700-nm $\leq 0.039 \cdot$ Absorbance at 430-nm, the beer is rated “free” of turbidity”; otherwise the rating is “turbid” is reported, indicating some visual scattering in the sample.

Example Calculation of of ASBC Beer Color and ASBC Turbidity

Following ASBC Beer-10 Color of Beer standardize sphere instrument in TTRAN mode using 10 mm path length cell filled with distilled water as top-of-scale standard.

The internal absorbance of liquid beer sample measured in 10 mm path length transmission cell was determined to be 0.31 at 430 nm and 0.01 at 700 nm.

- Conversion factor for transmission cell path length conversion from 10 mm to 0.5 inch = 1.27
- Absorbance of beer at 430 nm (A430nm) using 10 mm path length cell = $1.27 \times 0.31 = 0.394$
- Absorbance of beer at 700 nm using 10 mm path length cell = $1.27 \times 0.01 = 0.0127$

ASBC Beer Color = $10 \times 0.394 = 3.94 = 3.9^\circ$

ASBC Beer color is calculated to at least 2 decimal places and rounded to 1 decimal place for display in units of degrees ($^\circ$). The higher the ASBC Beer Color value; the lighter the beer. Consistency from lot-to-lot of the same beer type would also be important.

In terms of **ASBC Turbidity**, as A700nm of 0.0127 is less than $0.039 \times (A430nm = 0.394) = 0.0154$, this beer sample is rated as “free of turbidity”.

Advantages and Disadvantages of ASBC Color and Turbidity

Both of these metrics use objective quantification as a basis which is more consistent than visual evaluation of color and scattering in these liquids samples. However, for ASBC Turbidity, the reported values are either “turbid” or “free of turbidity”. These are acceptable for product specification but not as effective for characterizing lot-to-lot consistency in production. For this situation, either ASTM D1003 Transmission Haze or NTU Turbidity measurement would be preferred, as they report product scattering in a quantifiable scale based on instrumental measurement.

The situation regarding ASBC or equivalent EBC Color is similar. While based on spectral measurement and useful for reporting for product specification, the CIE colorimetric scales offer a complete quantification of product color. If the product is consistent in CIE L*, a*, b* D65/10 measurement, it will be consistent in the singular ASBC or EBC Color.