Spectronic
CamSpec Ltd

Application Note 101

Measuring Colour and Bitterness of Beer Using CamSpec M508 UV-Vis Spectrophotometer

According to IBD Methods of Analysis 9.1 and 9.16

Beer is enjoyed all over the globe as a refreshing alcoholic beverage and has a vast and diverse market. In recent years, craft beers have risen to popularity and are recognised by their distinctive colours and flavours. Although sensory analysis by a taste panel is essential to understanding the individual characteristics of a beer, a UV-Vis spectrophotometer can be employed to measure the consistent quality of the product.

The IBD (Institute of Brewing and Distilling) has published standard methods of analysis in order to measure the colour (9.1) and bitterness (9.16) of beer using a spectrophotometer. These are in line with the European standard method for sensory evaluation of beer by the EBC (European Brewery Convention). This article will explore these methods and procedures utilising a CamSpec M508 UV-Vis model spectrophotometer.

Measuring Colour of Beer

Beer has a variety of colours, from pale white ales to black beers such as porter and stout. The colour intensity of a beer can be determined using a photometric procedure, in which the absorbance of the beer is measured at a wavelength of 430nm with a CamSpec M508 spectrophotometer. The colour in standard EBC units is obtained by multiplying the absorbance by a factor.

Sample Prep

Cells of either 5mm or 10mm may be used for this procedure. The advantage of a 5mm cell is that beers of up to 40 EBC colour can be measured without the need for sample dilution. The beer sample should be diluted so that readings are below an absorbance of 0.8 in the chosen cell size.

If necessary, clarify worts by adding kieselguhr (1g/l) and prefilter before membrane filtration.

Filter the sample through a membrane filter. If the haze of the diluted sample is less than 1 EBC unit, filtration can be omitted.

Procedure

On the CamSpec M508, set the wavelength to 430nm, fill the cell with water and set the absorbance to read 0.00.

Rinse the cell and fill with the beer sample.

Read the absorbance.

Expression of Results

Calculate the colour of the undiluted sample using the formula:

Colour (EBC units) = A x f x 25

Where A = absorbance at 430nm in 10mm cell

Colour (EBC units) = A x f x 50

Where A = absorbance at 430nm in 5mm cell

f = dilution factor

Express the result in EBC units to 2 significant factors.

Measuring Bitterness of Beer

The bitterness flavour in beer comes from hops used to give beer its aroma and is one of the most important factors to consider when determining a beers' individual taste. Alpha acids are removed from hop flowers when boiled and are converted into iso-alpha acids, which provide beer with the bitter flavour and its foam stability.

The IBU (International Bitterness Units) of the sample is obtained by solvent elution of the bitterness components in the beer, followed by measurement of the absorbance value at 275nm with a CamSpec M508 spectrophotometer.

Safety Precautions

Iso octane is a highly flammable solvent and constitutes a fire risk. It must be handled accordingly with due regard to storage, use and disposal of residues.

Sample Prep

Beer is degassed either by standing the sample in open beakers or by pouring from one beaker to another. Best practice is to avoid loss of foam and allow the foam to collapse back into the beer. In the case of bottled or canned beer it is advisable to treat the whole contents of the container, using 1-2 drops of 1-octanol to control foam.

Procedure

10.0ml of degassed beer is pipetted into a 50ml conical flask and 20.0ml of iso octane is added. The flask is stoppered and attemperated in a water bath at 20°C (68°F).

Add 0.5ml of 6 mol/litre hydrochloric acid and shake the flask vigorously for 15 minutes using a wrist action shaker. Allow any emulsion to settle or centrifuge if required and transfer a sample of the clear iso octane layer to a 10mm silica cell. Exercise care in transferring iso octane to the spectrophotometer cell to avoid any carry over of emulsion. Determine the absorbance at 275nm against a reference cell containing pure iso octane.

Expression of Results

Calculate the result in bitterness units using the formula:

Bitterness (BU) = A x 50

Where A = Absorbance at 275nm in a 10mm cell

Conclusion

Consistent colour and bitterness in beer is crucial to producing a recognisable, branded product. Using a CamSpec M508 UV-Vis spectrophotometer to quantitively evaluate various beer characteristics enables continued high quality of the product.

A Note from Spectronic CamSpec Managing Director

"The CamSpec M508 is a rugged instrument that is very well suited for these tests and used by many breweries across the UK. For laboratories seeking equipment with more capabilities, I would recommend the modernised CamSpec M509T touchscreen model, which allows for wavelength scanning."

-Mark Brereton

Contact our team today to learn more about the colour and bitterness procedures and find out about our solutions for your products.

W: www.spectronic-camspec.co.uk
E: sales@spectronic.co.uk
T: 0113 286 4536

Twitter: www.twitter.com/SpecCams
LinkedIn: www.linkedin.com/company/spectronic-camspec

Resources

IBD Methods of Analysis 9.1 Colour of Beer: Spectrophotometric Method (IM) [Issued January 1997]
IBD Methods of Analysis 9.16 Bitterness of Beer (IM) [Issued April 2000]

Image Credits

Proriat Hospitality and Jon Parry on Unsplash