BREWING SUMMIT SAN DIEGO 2018

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Accurate measurement of beer and wort color in the presence of haze using integrating cavity spectroscopy

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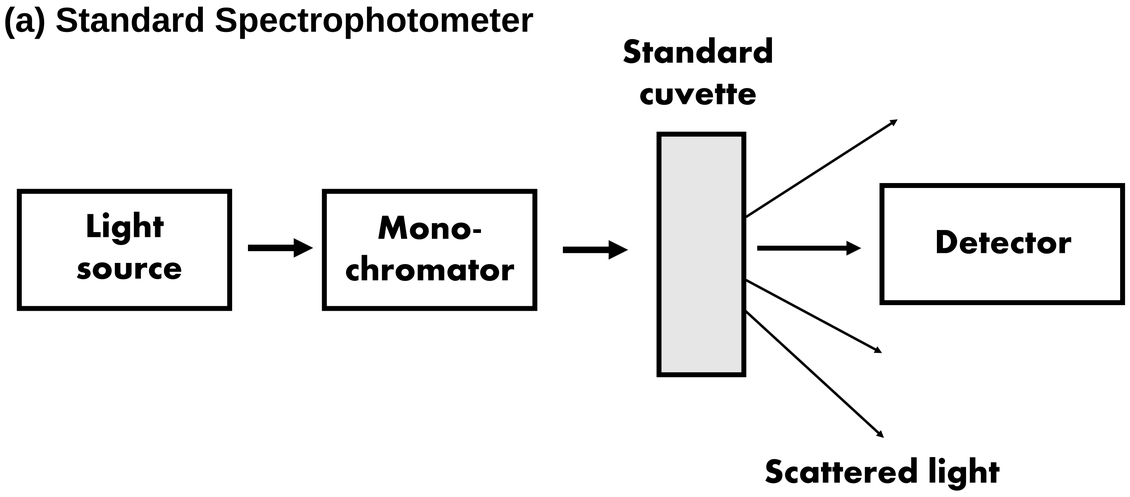
Introduction

Color is one of first perceptions consumers have of a beer and therefore, it strongly affects consumer preference making it a key quality parameter for the brewer. When evaluating malt, the color of Congress wort is used to predict final beer color. However, the standard method for determination of wort color, calculated from absorbance measurement at 430 nm, can be compromised by turbidity and requires pre-treatment to remove haze prior to absorbance measurement. Standard methods for removing haze include filtration using membranes or diatomaceous earth which are costly and time consuming, and can in some cases remove color leading to erroneous results.

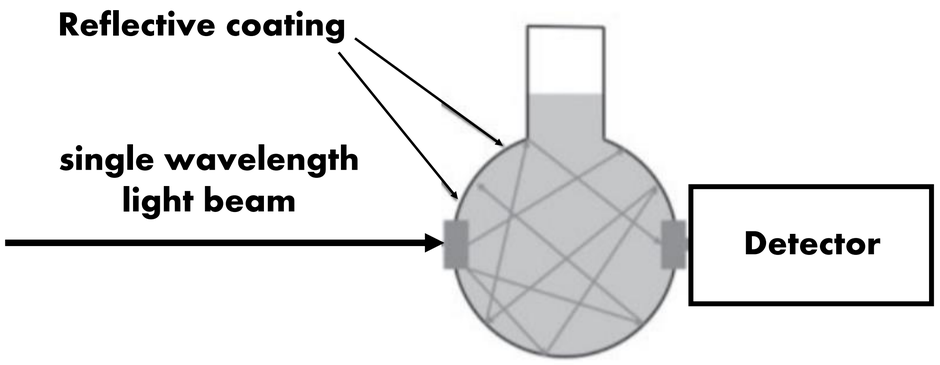
The OLIS iC 430 is a novel integrating cavity absorption meter that permits accurate absorbance measurements in turbid suspensions. The instrument employs a 430 nm LED light source and DeSa Suspension Presentation Cavity (DSPC) sample holder. The turbid sample is presented in a quartz cell mounted in a reflective coating. The incoming light is diffuse and thus cannot be further scattered by the sample. The resulting absorbance is path length corrected to 1 cm.

Figure 1. Comparison of optical design of traditional spectrophotometer and Integrating Cavity

(a) Standard Spectrophotometer



(b) DeSa Suspension Presentation Cavity (DSPC)



Methodology

Congress worts were prepared from barley malts, ranging widely in both turbidity and color. The color of each wort was determined before and after haze removal with dematiaceous earth filtration by measuring the absorbance at 430 nm using the OLIS iC 430 and also using a traditional focused dual beam spectrophotometer.

Results

Figure 2. Color measurement before and after filtration by absorbance measurement at 430 nm using a standard spectrophotometer

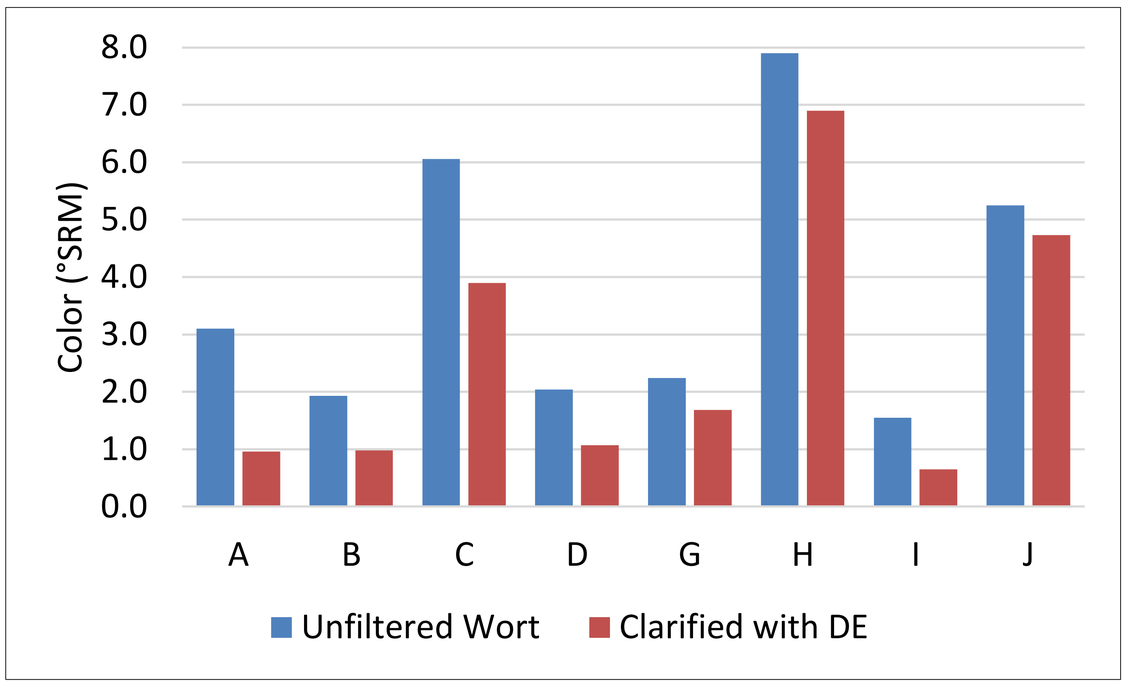
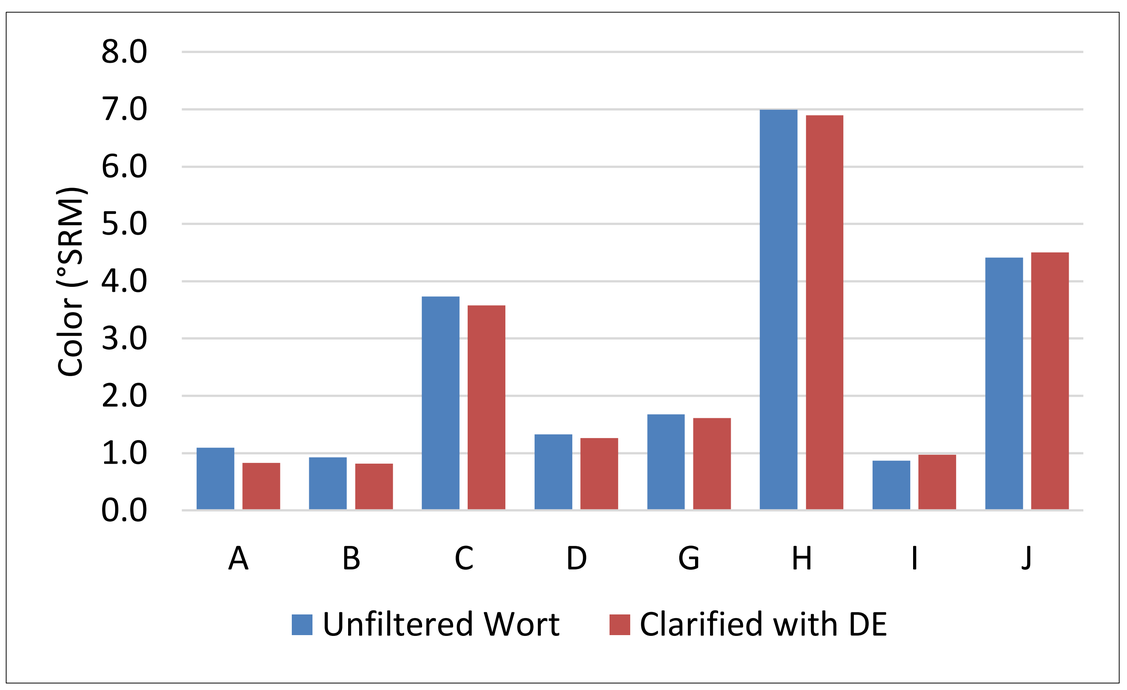


Figure 3. Color measurement before and after filtration by absorbance measurement at 430 nm using the iC430 spectrometer



Conclusions

Measurement of absorbance using the integrating cavity spectrometer were found to be independent of the scattering within the turbid samples, eliminating the need for haze removal leading to significant savings in effort and cost.

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