CONCENTRATIR2 MULTIPLE REFLECTION ACCESSORY **NO. 21154**

A Multiple Reflection ATR Study of Wines Using the ConcentratIR2™

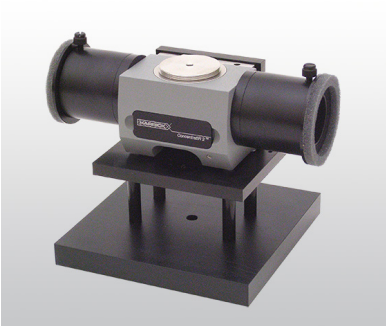

Figure 1. ConcentratIR2 Multiple Reflection Accessory

INTRODUCTION

Wines and grape juice have many spectral differences even if they are both made from the same type of grape. The purpose of this experiment was to confirm that differences between wine and juice, such as alcohol and sugar content variability, could be detected using multiple reflection ATR spectroscopy.

EXPERIMENTAL

The spectra were recorded using the ConcentratIR2 (Figure 1) in a commercial FTIR spectrometer equipped with a DTGS detector. Spectra were collected at 4 cm^{-1} resolution, a gain of 8, and signal averaged over 64 scans. The samples, wine and grape juice, were bought at a local supermarket. All of the wines contain 6 percent alcohol. The Lolailo sangria and one of the bottles of Zinful were purchased and opened in 2011, while the other three samples (grape juice, Chateau Diana, and another bottle of Zinful) were purchased in 2012. A single drop of each type was placed on the diamond ATR crystal, and infrared spectra were measured over a range of 4000 cm-1 to 650 cm^{-1}.

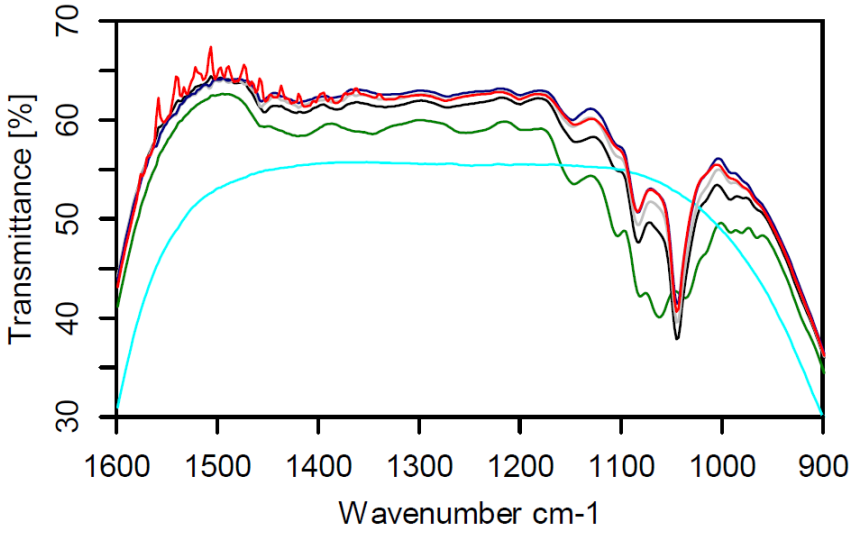

Figure 2. Spectra of all samples in the 1600 cm^{-1} to 900 cm^{-1} region. Chateau Diana (red), grape juice (green), Lolailo Sangria 2011 (black), Zinful 2012 (dark blue), Zinful 2011 (grey), and water (light blue).

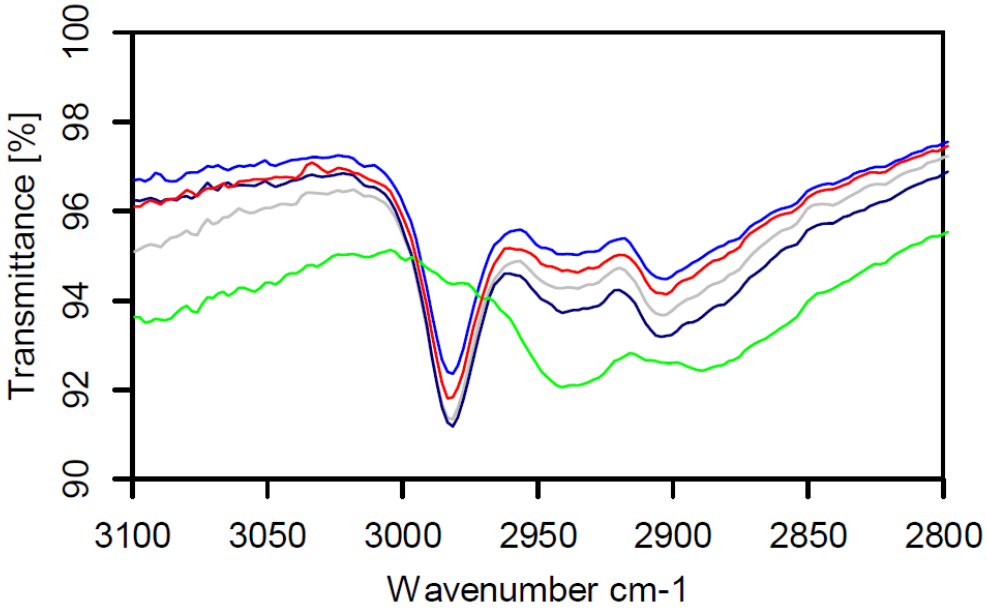

Figure 3. C-H peaks of samples with water subtracted. Chateau Diana (red), grape juice (green), Lolailo Sangria (black), Zinful 2012 (dark blue), Zinful 2011 (grey).

RESULTS AND DISCUSSION

Spectra of the wines are shown in Figure 2, along with the spectra of grape juice and water for reference. Note that water is more strongly absorbing in the 1600-900 cm^{-1} than the other liquids. The spectra of wines contain two peaks at 1100 cm^{-1} and 1050 cm^{-1} which are characteristic of ethanol (Figure 2). These peaks do not appear in grape juice or water, thereby confirming that they are unique to wine and likely due to ethanol. To further distinguish peaks, the spectrum of water was subtracted from the sample spectra. This resulted in the appearance of several C–H bands in the 3100 cm^{-1} to 2800 cm^{-1} region (Figure 3). Once again, all the wines show a peak at 2980 cm^{-1} which is typical of ethyl alcohol, while the juice sample does not. The pattern of C–H peaks in the same range for juice are also consistent with high glucose and fructose concentrations, particularly the broad pair of peaks at 2940 cm^{-1} and 2880 cm^{-1}. Unfortunately, there are no major differences in the spectra of the wines that allow one to be readily distinguished from another.

CONCLUSION

Many differences between wine and grape juice, including alcohol and sugar content can be detected using a high-throughput multiple reflection accessory like the ConcentratIR2.

REFERENCES

1. C. Chapados, J. J. Max, IR Spectroscopy of Glucose and Fructose Hydrates in Aqueous Solution. University of Quebec at Trois Rivières (2007).
2. Pelayo-Zaldívar, C. *Environmental Effects on Flavor Changes, in Handbook of Fruit and Vegetable Flavors* (ed Y. H. Hui), (2010).