Utilization of Capillary Electrophoresis Technique to Analyse Sugars in Ionic Liquid – STSM Collaboration

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Introduction

- The pre-treatment of biomass in ILs produces an incorporation of hydrolysed and degraded compounds in the recovered IL (Figure 1).[1] The high viscosity, high absorptivity and inherent chemistry of ionic liquid (IL) interactions imped the reliable analysis of those compounds in the conventional analytical techniques, such as HPLC and capillary electrophoresis (CE).
- The main goal proposed for this work was to learn and to optimise an adequate method for the qualitative and quantitative analysis of sugars in presence of the IL 1-ethyl-3-methylimidazolium ([emim][OAc]) using CE technique.

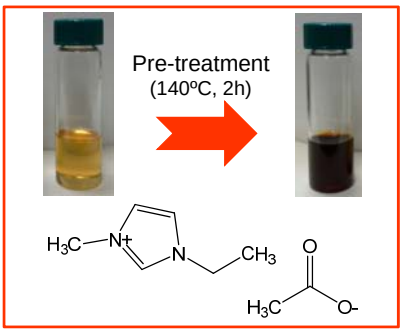

Figure 1. Chemical structure of [emim][OAc]

Experimental

- The study was performed using the Agilent Technologies CE system, equipped with a diode array detector (DAD) and a ChemStation data software. The employed methodology for sugar analysis was adapted from the literature reported elsewhere.[2] The influence of concentration of the IL [emim][OAc] on the detection of six standard sugars, namely glucose, galactose, xylose, arabinose, cellobiose and sucrose was evaluated.

Results and Discussion

- The electropherograms of each sample are presented in Figure 2. The smallest IL concentration (200mM) has no significant influence on the shape of sugar absorptions, but higher concentrations of IL, such as 400mM, decrease the intensity and sensitivity of the absorptions. The highest concentration tested (800mM) produced very low detection and resolution of examined sugars.
- Calibration curves of standard sugars in the presence of lower IL concentrations (100, 200 and 300mM) were constructed. Using 300mM IL concentration the linearity of calibration curves is not feasible for quantification. At lower IL concentrations (100 and 200mM) all calibration curves presented RSD (%) of migration time <1 demonstrating lower variability of data. For instance, R^2=0.9932 was achieved for the calibration curve of galactose in 200mM IL.

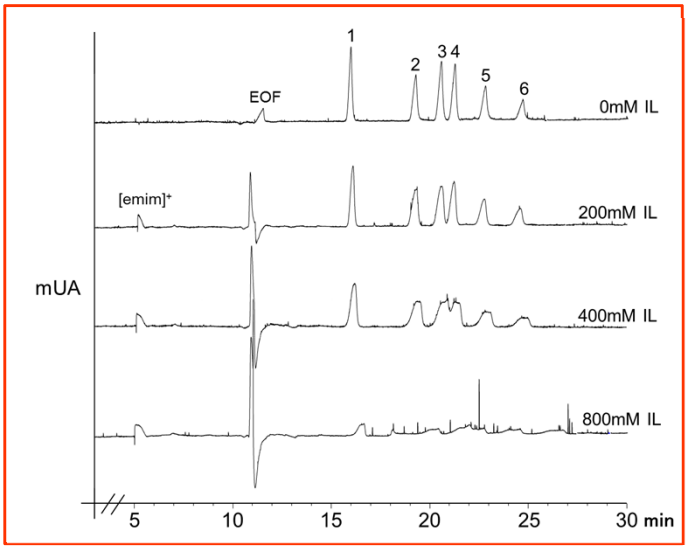

Figure 2. Electropherograms of six standard saccharides (1.0 mM each) in the presence of [emim][OAc] IL at different concentrations. Peak identification: 1-sucrose, 2-cellobiose, 3-galactose, 4-glucose, 5-arabinose, 6-xylose.

Conclusions

- The concentration 200mM [emim][OAc] should be the maximum concentration for the quantification of sugars present in this IL using the adopted CE method. New ILs should be analogously screened.

Acknowledgments

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References

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