**Characterization of beer haze using AF4**

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### Introduction

Crystal clear beer and colloidal beer haze stability are important quality parameters of many beer types. Beer haze is in most cases unwanted and consists of a very complex mixture of macromolecules, including polysaccharides, polyphenols and proteins.

Better understanding of the nature of the beer haze is essential to prevent or resolve it. For this, advanced analytical methods enable to assess the complex structure of haze. Recently, the applicability of Asymmetrical Flow Field-Flow Fractionation (AF4) was investigated for beer haze characterization.

In this study, the development of a novel analytical method for (native) beer haze profiling based on AF4-UV-DAD-MALLS-dRI (ultraviolet, fluorescence, differential refractometry and multi-angle laser light scattering detector) is described. Preliminary results are shown of several randomly chosen (lager type) beers from the market. AF4 reduces sample preparation to a minimum and the obtained beer haze profiles contain valuable information on haze composition.

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### Experimental

**Figure 1.** Principle of AF4 separations (Wyatt Technologies, http://www.wyatt.com/images/graphics/theory/fff/fff_crossflow.png)

**Figure 2.** Analytical setup for beer analysis using AF4-UVDAD/MALLS-DR

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### Results

**Table 1.** Analytical settings

<table>
<thead>
<tr>
<th>Detector settings</th>
<th>Specificity</th>
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<tbody>
<tr>
<td><strong>UV</strong> 280 nm</td>
<td>Proteins + polyphenols</td>
</tr>
<tr>
<td><strong>UV</strong> 320 nm</td>
<td>Polysaccharids</td>
</tr>
<tr>
<td><strong>DAD</strong> UV/VIS spectrum 240-800 nm</td>
<td>Any compound with UV absorption in the 240-800 nm range</td>
</tr>
<tr>
<td><strong>FLR</strong> Ex278, Em338 nm</td>
<td>Proteins + probably some polyphenols</td>
</tr>
<tr>
<td><strong>FLR</strong> Ex280, Em305 nm</td>
<td>Polyphenol like</td>
</tr>
<tr>
<td><strong>FLR</strong> Ex280, Em450 nm</td>
<td>Polyphenols</td>
</tr>
<tr>
<td><strong>dRI</strong> Refractive index</td>
<td>Polysaccharides after corrections</td>
</tr>
<tr>
<td><strong>MALLS</strong> 19 angles</td>
<td>Molecular size properties</td>
</tr>
</tbody>
</table>

**Figure 3.** Results of the AF4-UVDAD/MALLS-MALSS analyses of 4 different commercial beers and 2 ‘other’ beers with haze.

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### Conclusions

- This AF4 method developed for beer shows to be very promising for characterization of macromolecules in beer.
- Allows quick and easy sample preparation: the sample is directly injected, after degassing the beer.
- Interesting information can be obtained from the results: 6 different regions can be recognized in the AF4 profiles.

- The AF4 method allows for easy fractionation of the samples, for further characterization with different techniques: NMR, proteins-, polyphenols-, and sugar analyses.
- Next steps focus on correlating observed particular beer hazes to specific signals in the spectrum

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### References

