

Characterization of Macromolecules in Beer Using Asymmetrical Flow Field-Flow Fractionation with Multi Angle Light Scattering (AF4-MALS)

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Abstract: Beer is a complex mixture of various types of macromolecules including proteins and polysaccharides. Macromolecules in beer are produced during brewing that involves various modifications of proteins and polysaccharides of barley seeds, and there is an increasing demand for in-depth and accurate analysis of the macromolecules in beer. It is known that physical properties of proteinaceous molecules are closely related to the mechanism of formation and foam stability. Presence of some proteinaceous molecules results in haziness of beer. The presence of polysaccharides with high molar masses tends to increase the viscosity and turbidity of beer. In this study, three types of beer were prepared using the mashing process. Asymmetrical flow field-flow fractionation (AF4) was used to separate the macromolecules in beer based on their size. Then AF4 was coupled online with multi-angle light scattering (AF4-MALS) for determination of the molar mass distribution and also for quantitative analysis of various macromolecules in beers. The components in beer were identified by enzymatic treatment method. The results reveal that AF4-MALS is a useful tool for separation and characterization of various types of macromolecules in beer, and thus for monitoring of the changes in the macromolecular composition in beer during the mashing process.

Keywords: Macromolecules, Asymmetrical flow field-flow fractionation (AF4), Multi angle light scattering (MALS), Beer