Characterization of Polysaccharide Derivatives by Size-Exclusion Chromatography and Field-Flow Fractionation

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Interest in efficient and sustainable conversion of biomass to bioproducts has increased in all sectors over the past few decades. Biomass-derived polysaccharides, such as plant cellulose and hemicelluloses are sustainable alternatives to synthetic polymers. The structural tailoring (chemical, physical or enzymatic) of polysaccharides is under continuous research in order to improve their material properties. Hydroxypropylation has been used for the modification of cellulose and xylan. Hydroxypropyl xylan (HPX) has been shown to be a potential material in films and coatings that could be used in biodegradable packaging [1]. Cationic polysaccharides that possess amino or ammonium functional groups have already many applications in papermaking, chemical, food, cosmetic, pharmaceutical, petroleum, and textile industries. One of the highly potential application for cationic polysaccharides is to use them as flocculants in wastewater treatment [2].

Here, we focus on the size-exclusion chromatography (SEC) characterization of HPX samples having varying degree of substitution (DS) [3] and field-flow fractionation characterization of ammonium functionalized celluloses. We will discuss how DS affected the optical behavior of the HPX samples in solution, and further the accuracy of the molar masses obtained by light scattering technique. Also, the effect of chemical structure on the chain conformation will be discussed. In case of cationic celluloses, eluent composition played a significant role in the successful FFF separation of samples with varying amount of cationic substituents.

References
[1] K.S. Mikkonen et al., Combination of internal and external plasticization of hydroxypropylated birch xylan tailors the properties of sustainable barrier films, European Polymer Journal 66 (2015) 307