

Lignocellulosic hydrolyzate characterization using anion exchange chromatography

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Abstract

Hydrolyzates from lignocellulosic biomass are a complex mixture of soluble monomeric and oligomeric fragments. These fragments are degradation products from all four natural polymers cellulose, hemicellulose, pectin and lignin. As the polarity and size varies for all fragments depending on the origin, the analysis requires more than one analytical method and a broad know how. Anion exchange chromatography (AEC) has a great potential as the measurement is based on the ability of producing anions from soluble lignocellulosic biomass derived fragments. Thus, the aim of this study was to characterize hydrolyzates from different biomasses for soluble biomass derived degradation products with AEC. Therefore, the parameters column temperature (30°C to 50°C), eluent composition and chromatographic run time were investigated for separation of the biomass derived degradation products and short chromatographic run time. The final method was set to a column temperature of 40°C, an eluent flow of 1mL/min and an eluent consisting of sodium acetate and sodium hydroxide as well as ultrapure water. Using the newly developed method a run time of 70 min could be realized for degradation products from all natural polymers. Additionally, the limit of detection in the range of 0.014 mg/L for 2, 6-dimethoxyphenol and 21.9 mg/L for 4-methoxybenzyl alcohol allows for a simultaneous determination of lignin derived compounds beside the high glucose concentrations. In consequence AEC was used to characterize hydrolyzates from 17 lignocellulosic biomasses for soluble compounds derived from cellulose, hemicellulose, pectin and lignin.

Biography

Nico Anders has been working in the field of analysis and renewables since 2009. He has obtained his PhD at the TU Braunschweig in the group of Prof. Dr. Vorlop in technical chemistry. Since 2013, he is working as junior research group leader in the Aachener Verfahrenstechnik at the RWTH Aachen University. The research interests of Nico Anders are analysis of lignocellulosic biomass, green analytical chemistry, conversion of lignocellulosic biomass and chromatographic separation.

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