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Optimization and kinetic investigations on the selective, oxidative conversion of lignocellulosic biomass using the POM-IonoSolv-Process

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PURPOSE OF THE ABSTRACT

Biomass is commonly recognized as one of the most important renewable resources. Therefore, various strategies for producing chemicals and fuels from biomass are under investigation as alternative, non-fossil feedstock. Among the types of biomass available for energetic applications, lignocellulosic biomass is highly desirable as it is not in direct or indirect competition with food production. Lignocellulosic biomass typically consists of hemicellulose (25 %), lignin (25 %), cellulose (40 %) and ca 10 % other, minor components. [1] Hereby, especially cellulose is highly valuable for material applications as well as further processing for the generation of biofuels. Furthermore, lignin and hemicellulose can be used at least partly for the production of bulk chemicals or for the generation of energy.

One possibility to generate high value from lignocellulosic biomass offers the so-called ?POM-Ionosolv?-process. This process combines the fractionization of lignocellulosic biomass and the selective oxidation of the dissolved compounds. Hereby, hemicellulose and lignin are first selectively extracted using a protic ionic liquid/water mixture while the containing cellulose is not affected. The dissolved compounds are then selectively in-situ oxidized to short chain carboxylic acids like formic acid and acetic acid using polyoxometalate catalysts. Besides those short chain carboxylic acids, additionally a cellulose rich pulp is produced, that can be further converted via enzymatic saccharification and fermentation.

In this contribution, detailed investigations on the selective, oxidative conversion of lignocellulosic biomass using the POM-Ionosolv process have been made. As the first process step ? the fractionization of the lignocellulosic biomass ? is the rate determining step of the process, we performed a detailed sensitivity analysis using Box-Behnken-Design of experiments (DoE) to get a deeper understanding of the crucial influences on the process. Furthermore, we additionally provide detailed kinetic investigations.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS
lignocellulosic biomass | biomass fractionation | design of experiments | process optimization

BIBLIOGRAPHY

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