

Abstract

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UV-Vis spectroscopy and chemometrics for the monitoring of organosolv pretreatments.

Lignocellulosic agricultural side products like wheat straw are widely seen as an important contribution to a sustainable future economy. However, the optimization of biorefinery processes, especially the pretreatment step, is crucial for an economically viable biorefinery. The monitoring of this pretreatment process in terms of delignification and the generation of the fermentation inhibitors acetic acid, furfural, and hydroxymethylfurfural (HMF) is essential in order to adapt the process parameters for a desired outcome and an economical operation. However, traditional wet chemistry methods are time-consuming and not suitable for on-line process monitoring.

Therefore, UV-Vis spectroscopy in combination with partial least-squares regression was used for the determination of the concentrations of lignin, acetic acid, furfural, and HMF. Five different data blocks with increasing amounts of impurities were investigated to evaluate the influence of the inevitable impurities on the calibration models.

Lignin showed a good prediction accuracy with 95% tolerance intervals between ± 0.46 to ± 1.6 mg/L for concentrations up to 30 mg/L. Also, the other components could be predicted with a sufficient accuracy for on-line process monitoring. A satisfactory calibration can be obtained with 10 to 20 reference samples valid at process temperatures between 160 °C and 180 °C.

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<http://www.mdpi.com/2305-7084/2/4/45/pdf> (open source)

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