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Data Article

Enzyme-based lignocellulose hydrolyzation – Brief data survey for cellulase performance characterization on behalf of the Sauter mean diameter of raw material particles

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ABSTRACT

The data presented here supports the informational background of enzyme-based lignocellulose hydrolyzation, cellulase characterization, and sugar yield prediction for the work "Enzyme-based lignocellulose hydrolyzation – Sauter mean diameter of raw materials as a basis for cellulase performance characterization and yield prediction" by Glaser [1]. Glucose yields from the enzymatic hydrolysis of the raw materials were shown as a function of cellulase enzyme loading as well as of particle size with different solid loading. The data for the proposed methods of the determination of enzyme activity in inhomogeneous samples of lignocellulosic raw materials are presented. The data of the empirical model that was developed for the prediction of hydrolysis yields for different enzyme concentrations, substrate specific particle size, and solid loadings, are given. Data are also given in relation of terms of scale-up opportunities.

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Specifications Table

Subject area	Biotechnology
More specific subject area	Bioresources, cellulases
Type of data	Table
How data was acquired	- Enzymatic hydrolyses of lignocellulosic raw materials - Glucose determination by high-pressure liquid chromatography - Mathematical model equation, parameter adjustment, and model simulation - Torque measurement by the used Heidolph stirrer and determination of the power number of the used setup
Data format	Raw, filtered, analyzed
Experimental factors	The raw materials were milled and used naturally dried. Different amounts of protein of the cellulase enzyme mixtures were used for hydrolyses of the lignocellulose raw materials. Characterization of cellulase enzyme mixtures by different particle size fractions of wheat straw was undertaken. Hydrolysis data are used to define a kinetic unit for the estimation of cellulase performance in inhomogeneous raw materials. The defined kinetic unit was used for the yield prediction with an empirically defined model equation in different scales
Experimental features	Using Sauter mean diameter of lignocellulosic raw materials for cellulase characterization and yield prediction in scale-up processes
Data source location	Potsdam, Brandenburg, Germany
Data accessibility	Data is presented in this article

1. Value of data

- The estimation of cellulase performance for industrial-scale processes holds special challenges. There exists a gap between the enzyme performance in a laboratory and in large-scale processes. As a standard tool for cellulase characterization, the determination of the filter paper units (FPU) through the filter paper assay (FPA) [2] is given.
- With the data which is given in the following and the methods given by Glaser [1], it is possible to define a self-specified cellulase unit via easy measurable process properties, e.g. cellulase enzyme loading and mixture, lignocellulose solid loading, type of lignocellulose, and particle size distribution of the given raw materials. The thereby defined cellulase unit will be facile and generally understandable.
- The data given here will provide a first step to characterize and compare a user-defined process due to the easy application of the model [1].

2. Data

The cellulase performance was determined as a function of cellulase enzyme loading, particle sizes of different raw materials, and different solid loadings.

Raw materials such as wheat straw, pulverized wheat straw, grass, pine wood, aspen wood, and rice straw as well as glucose yields were used.

Torque data and power numbers of the reactor setting were obtained for scale comparison.