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OrCaCel - OrganoCat plant and pulping combinations for the full valorisation of lignocellulose from marginal land grown perennial plants

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For a reliable and sustainable production of bio-based chemicals and fuels, the development and enhancement of next generation bio-refineries is of great importance. Lignocellulose represents a valuable resource for these purposes but the full valorisation of lignocellulosic residues is a crucial step to obtain ecological and economic figures. The recently developed OrganoCat process is a promising alternative to deliver non-degraded fractions of the three main carbon components of lignocellulose. The OrCaCel project aims to combine plant science with analytics and chemical engineering to adapt the OrganoCat process for different types of plant biomass obtained from perennial plants growing in low-input production to minimize environmental footprint. Avoiding the competition with food and feed, alternative cultivation strategies such as usage of marginal lands is essential for a sustainable biomass valorisation. An important aspect is the effect of cultivation and harvesting conditions of the biomass and if it affects the composition of the produced biomass and thus the subsequent disintegration and fractionation. Within the OrCaCel project we focus on perennial plants such as *Sida hermaphrodita* and *Silphium perfoliatum*, which can be cultivated on marginal lands and produce high amounts of biomass. Especially favourable, these plants are not competing with food or feedstock, e.g. corn or sugar beet. Plants are monitored over a complete life cycle and feedstock qualities were determined by the ratios of the main cell wall components (e.g. pentose-hexose ratio, cellulose-hemicellulose–lignin ratio) in a particular harvest, i.e. plant development stage. The project integrates cultivation of biomass and disintegration of lignocellulose to develop an overall improved production-utilisation system. To understand the influence of growth stages on the perennial plant biomass, compositional analyses were conducted. These facilitate the selection of the appropriate harvest time point to obtain the most suitable biomass composition for the OrganoCat process. Vice versa, the pre-treatment efficiency and the fractionation of the OrganoCat process was improved.

Literatur

- [1] Grande, P., Viell, J., Theyssen, N., Marquardt, W., Domínguez de María, P., Leitner, W. (2015) Fractionation of lignocellulosic biomass using the OrganoCat process. *Green Chem.*, 2015, 17:3533