



Novel aspects in the enzyme-based transformation of polyphenols

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Abstract

The biotechnological conversion of lignocellulosic biomass is widely used within the development and refinement of biorefinery processes. Rather than functionalising lignin, however, enzymatic treatments are currently used during the initial pre-treatment of biomass for easing separation of components, or for funneling purposes during the production of different fuel classes out of initial degradation products. Numerous studies exist that describe the use lignocellulosic enzymes of laccases, peroxidases, cellulases in biorefinery processes. Nonetheless, enzymes can be used also for specifically functionalising polymeric and monomeric phenols.

We present here results obtained for the use of lipoxygenase for the valorisation of lignin that are based on detailed mechanistic insights. We used commercially available lipoxygenase (EC 1.13.11.x) for structurally modifying lignins. We further employed commercially available laccase (EC 1.10.3.2) to generate different structural features within oligomeric lignin chains such as to modify them for surface applications by covalently linking functional moieties naturally not present in lignin to the lignins via non-hydrolysable bonding motifs.

Biography

Heiko Lange holds a tenure track position as Assistant Professor for Organic Chemistry at the Department of Pharmacy at the University of Naples 'Federico II'. His research includes the sustainable synthesis of potent drug scaffolds, the development of natural polyphenol-based nanostructured functional particles, capsules and fibres for controlled and targeted drug delivery purposes and the structural characterization of polyphenols by advanced analytical techniques. He is also experienced in the chemical and biotechnological modification of polyphenols. HL, synthetic organic chemist by training, gathered additional experiences in adjacent fields during postdoctoral stays at the University of Cambridge and at the Harvard University. His (h-index 21) is (co)author of more than 40 scientific publications in peer-reviewed journals with more than 1600 citations, patents and numerous presentations at national and international conferences. He acts as reviewer for various journals and as academic editor.

Publications

1. Lignin Fractionation in Segmented Continuous Flow
2. Structural and Thermal Characterization of Novel Organosolv Lignins from Wood and Herbaceous Sources
3. Functionalized Organosolv Lignins Suitable for Modifications of Hard Surfaces
4. Characterization of Eucalyptus nitens Lignins Obtained by Biorefinery Methods Based on Ionic Liquids
5. Lignin for Nano□ and Microscaled Carrier Systems: Applications, Trends, and Challenges

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