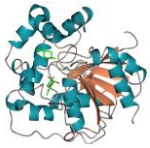

European Society of Applied Biocatalysis

European Technology Platform for Sustainable Chemistry

ESAB-SusChem Webinar

Biocatalysis and Sustainable Chemistry: Biocatalysis and Renewables

June 24th 2022

14.00-16.00 Central European Time (CET)
08.00-10.00 Eastern Daylight Time (EDT)
13.00-15.00 British Summer Time (BST)
20.00-22.00 China Standard Time (CST)

Chairs: Pablo Domínguez de María (Sustainable Momentum SL, ESAB Working Group Sustainable Chemistry, SusChem Management Team)
Andrés R. Alcántara (Complutense Univ. of Madrid, ESAB Working Group Sustainable Chemistry, SusChem Board)

PROGRAMME

14.00 CET Prof. Dr. Stefan Buchholz, Head of R&D for the Division Nutrition & Care, Evonik Operations GmbH, Germany

Biocatalysis – Opportunities and challenges for industrial production

Biocatalysis and renewable resources are enablers of a more sustainable chemistry. Examples from the last 20 years like emollient esters, polyamide-12 and biosurfactants will be discussed highlighting opportunities and limitations from an industrial perspective.

14.30 CET Prof. Dr. Harald Gröger, Faculty of Chemistry, Industrial Organic Chemistry and Biotechnology, Bielefeld University, D-33501 Bielefeld, Germany

Biotransformations as Key Steps in the Conversion of Unsaturated Fatty Acids into Industrial Chemicals

Today the production of industrial chemicals is still mainly based on fossil feedstocks. Thus, there is a high demand for novel processes as well as novel industrial products, which are produced from renewable raw materials such as, e.g., fats and oils. In this presentation, various transformations of unsaturated fatty acids into molecules of industrial interest by means of biocatalytic key steps are described. One example is the synthesis of a new generation of fatty acid esters as lubricants starting from oleic acid, which has been developed within an academic-industrial research project. A second example represents the chemoenzymatic synthesis of fatty nitriles and fatty amines (needed for, e.g., lubricants and detergents) based on the combination of hydroformylation and aldoxime dehydratase-catalyzed nitriles synthesis as key steps. A third example is the synthesis of the jasmonic acid precursor and plant hormone 12-OPDA by means of a biocatalytic three-step one-pot cascade utilizing linolenic acid as a starting material.

PROGRAMME

15.00 CET Prof. Dr. Ning Li, Professor of Biocatalysis, School of Food Science and Engineering, South China University of Technology, Guangzhou 510640, China

Chemobiocatalytic upgrading of furfural to C4 chemicals

Chemobiocatalytic selective transformations are attractive yet challenging tasks, because of the integrated advantages of chemical catalysis with biocatalysis and the incompatible issues between different types of catalysts. Herein, I present one-pot, multi-step cascades integrating biocatalysis with photo-, electro-, base- and organocatalysis for the valorization of furfural to various value-added C4 chemicals such as maleic acid, fumaric acid, L-Aspartic acid, L- and D-malic acid by addressing the incompatible issues.

15.30 CET Prof. Dr. Bruno Moerschbacher, Institute for Biology and Biotechnology of Plants, Münster University, Germany

Enzymes for converting chitin/chitosans into highly valuable products

Chitin is one of the most abundant biopolymers on Earth and, thus, an almost inexhaustible renewable resource. Chitin can be partially de-*N*-acetylated to yield chitosans, a class of biopolymers with superior material properties and versatile biological functionalities. Chitosans are linear co-polymers of glucosamine and N-acetylglucosamine residues, differing in their degree of polymerisation (DP), fraction of acetylation (FA), and pattern of acetylation (PA). Commercially, chitosans are produced from chitin by partial alkaline deacetylation and partial acid hydrolysis, controlling FA and DP, but yielding chitosans with random PA only. However, we have proposed – and first evidence now also suggests – that beyond DP and FA, PA critically determines the bioactivities of chitosans. Therefore, we are using chitin and chitosan modifying enzymes of chitosan-containing and chitin/chitosan-degrading organisms, such as chitin deacetylases, chitinases, and chitosanases, to convert chitin into chitosans, giving us control over DP, FA, and PA. We have developed enzymatic-mass spectrometric fingerprinting methods for the in-depth structural analysis of chitosan oligomers and polymers. And we are using well-characterised ‚second generation' chitosans in a variety of biological assays to quantify their functionalities, such as antimicrobial and plant strengthening activities. In this way, we can optimise the performance of chitosan-containing products, e. g. for agriculture, overcoming the classical limitations of low efficacy and poor reproducibility of traditional agro-biologics.

ABOUT THE SPEAKERS

Prof. Dr. Stefan Buchholz studied chemistry at the University of Marburg and performed his PhD at the Max-Planck-Institute for Polymer Research in Mainz (group of Prof. Dr. G. Wegner). He moved to Harvard as a post-doc, where he stayed for two years in the group of Prof. G.M. Whitesides. In 1993 he joined Evonik AG (then Degussa) as a group leader, and since then he has held numerous positions in R&D and innovation units, being currently the Head of R&D for the Division Nutrition & Care. During his extensive industrial career, Prof. Buchholz has held positions related to Biotechnology, in particular Head of the Project House Biotechnology, and of the Project House Proferm, where different biocatalytic and biotechnological processes were envisioned, developed, and scaled-up to industrial conditions. Prof. Buchholz has published more than 35 publications and holds more than 20 patents and patent applications. He has received several awards in areas related to biocatalysis, in particular the Fine Chemical of the Year award 2003 from Frost & Sullivan for the development of the new hydantoinase process, or several Degussa Innovation Awards for different newly established biocatalytic processes related to asymmetric synthesis and fine chemicals.

Prof. Dr. Harald Gröger studied Chemistry at the Universities of Erlangen-Nürnberg and Oldenburg and received his diploma degree in Chemistry from the University of Oldenburg in 1994. After receiving his doctoral degree from the same university in 1997, he stayed as a postdoctoral fellow at the University of Tokyo from 1997 to 1998. In 1998 he joined the research department Chemische Forschung of SKW Trostberg AG. After the merger with Degussa-Hüls AG to Degussa AG in 2001, he became Project Manager in the Project House Biotechnology of Degussa AG. From 2004 to 2006 he worked as a Senior Project Manager at the research unit Service Center Biocatalysis of Degussa AG. From 2006 to 2011 he was Associate Professor of Organic Chemistry at the University of Erlangen-Nürnberg and since April 2011 he is Full Professor of Organic Chemistry at Bielefeld University. Harald Gröger and his teams were awarded the Degussa Innovation Award 2003 (category: new products) and the Degussa Innovation Award 2005 (category: new or improved processes). In addition, he was awarded the Carl-Duisberg-Memorial-Prize 2008 of the German Chemical Society (GDCh), the Otto Roelen Medal 2014 of the DECHEMA and the German Catalysis Society (GeCatS) and visiting professorships at Osaka University in 2014 and Toyama Prefectural University in 2019. His research interests center on the development of enzymatic processes, the combination of chemo- and biocatalysis towards chemoenzymatic one-pot processes and the development of sustainable and technically feasible processes for the production of industrial chemicals.

ABOUT THE SPEAKERS

Prof. Dr. Ning Li is Professor of Biocatalysis at the School of Food Science and Engineering in South China University of Technology. He obtained his PhD in biochemical engineering from South China University of Technology in 2008. He began his independent research career as a Lecturer at the School of Food Science and Engineering in South China University of Technology at the same year, and continued his interest on nonaqueous enzymology. Then, he became Professor at the same school of South China University of Technology in 2017. His current interests are in biocatalysis, enzymatic regeneration of cofactors, biomass valorization, enzymatic synthesis of bio-based chemicals, and green chemistry. Especially, he focuses his interest on (chemo)biocatalytic valorization of bio-based furans, and enzymatic regeneration of nicotinamide cofactors.

Prof. Dr. Bruno Moerschbacher is Professor of Plant Biochemistry at WWU Münster University since 1995. His main research interest is in elucidating molecular structure-function relationships and cellular modes of action of functional biopolymers, in particular of partially acetylated chitosans. Lately, the focus of his research is on the biotechnological production and the enzymatic modification of chitosans, as well as on the development of enzymatic-mass spectrometric fingerprinting analysis tools, to improve the performance of chitosans for applications in agriculture, biomedicine, and beyond. The research projects of his group are always interdisciplinary and mostly international and intersectorial, involving partners from Academia and Industry in Europe and beyond, especially in India and Brazil. He has supervised ca. 45 undergraduate, ca. 115 graduate, and ca. 50 doctoral students, and co-authored ca. 150 scientific publications in peer-reviewed international journals. He has supported the foundation of two biotech start-up companies, Evorion Biotechnologies and BexBioTec, and he is currently involved in the foundation of two more, greEnCAP and AgriBluBio. Since 2017, he is President of the European Chitin Society.

NEXT ESAB WEBINARS

ESAB aims to promote the development of Applied Biocatalysis and takes initiatives in areas of growing scientific & industrial interest in the field.

Schedule and Topics of the next ESAB webinar:

29th July 2022 10.00-12.00 CET	Biocatalysis and Molecular Medicine, organized by Roland Wohlgemuth, Jennifer Littlechild and Thomas Sauter
26th August 2022 14.00-16.00 CET	Synthetic Biology and Metabolic Engineering Tools and Methodologies, organized by Frangiskos Kolisis and Roland Wohlgemuth
23rd Sept. 2022 14.00-16.00 CET	Advances in the Analysis of Enzymatic Reactions, organized by Jennifer Littlechild and Roland Wohlgemuth

HOW TO JOIN ESAB

You are cordially invited to join ESAB by completing the membership application form online *via* https://esabweb.org/Join+us/Application+form.html

Personal membership is free.

Institutional membership is welcome and is currently being established as new membership category.

ESAB has been founded in 1980 and has the mission of promoting the development of Applied Biocatalysis throughout Europe. The aims of ESAB are to promote initiatives in areas of growing scientific and industrial interest of importance within the field of Applied Biocatalysis.

Further information on ESAB Conferences and other activities can be found on the ESAB website www.esabweb.org

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