Hong Kong University of Science and Technology
Department of Chemical & Biological Engineering

Catalytic Valorization of Biomass-Derived Platform Molecules in Continuous Flow: From Furfural and Glycerol to Value-Added Chemicals

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Venue : **Rm 5620 (near Lift 31/32), HKUST**

Abstract

The principles of sustainable development, the bioeconomy, and the circular economy are increasingly motivating the development of innovative routes to value-added chemicals from renewable carbon resources. In this context, furfural and glycerol have emerged as versatile biomass-derived platform molecules, offering access to a broad range of valuable products. Their efficient conversion requires selective catalytic systems and process technologies that are consistent with the principles of green chemistry. This presentation will highlight recent advances in the catalytic conversion of furanic and glycerol-derived platform molecules under continuous-flow conditions. Representative target products include furfuryl alcohol, levulinic acid and its esters, γ-valerolactone, acrolein, quinoline derivatives, solketal, triacetin, and glycerol oligomers. These compounds can be obtained from biomass-derived feedstocks and carbohydrate-based substrates using both homogeneous and heterogeneous catalysts. Particular emphasis will be placed on the integration of catalyst design, reaction engineering, and continuous-flow processing to enhance productivity, selectivity, and process efficiency. Key operating parameters—including temperature, catalyst and substrate loading, solvent composition, residence time, and feed concentration—will be examined in relation to conversion, product distribution, reaction rate, and overall process sustainability. Continuous- flow operation can provide additional benefits, including improved heat and mass transfer, enhanced process control, reduced reaction times, and opportunities for safer and more readily intensified processing.

Beyond the catalytic transformations, the design, synthesis, and comprehensive physicochemical characterization of the resulting bio-based products will also be discussed. Overall, these examples illustrate the potential of combining molecular catalyst development with continuous-flow technologies to establish more efficient and sustainable routes for the valorization of renewable carbon resources [1–6].

References

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P5 C.R. Sagandira, C. Len. Microwave-assisted continuous flow synthesis of Propofol. Sustainable Chem. Pharm. 2024, 42, 101793.

P6 R. Nguyen, A. Auvigne, A.M. Perez Merchan, I. Malpartida, C. Len. New highthroughput mechanochemistry assisted continuous flow for the formation of deep eutectic solvents. Org. Process Res. Dev. 2024, 28, 3560-3569

Biography

Prof. Dr. Christophe Len received his Ph.D. in Chemistry from the Université de Picardie Jules Verne (France) in 1995, followed by a postdoctoral fellowship at the University of Hull (UK). In 1997, he was appointed Assistant Professor at UPJV and was promoted to Full Professor at the Université de Poitiers (France) in 2004. In 2010, he joined the Université de Technologie de Compiègne (France) as Full Professor. Since 2017, he has conducted his research at Chimie ParisTech, PSL University (France). Prof. Len has published more than 290 original research and review articles, 13 book chapters, and 11 patents, with an H-index of 54 and more than 10,000 citations (Scopus). His scientific career has been recognized through several international distinctions. He was appointed Honorary Professor of the University of Hull, UK (2012–2018)**,** Honorary Professor at the University of Delhi, India (2022), and Honorary Professor at Xi'an Jiaotong University, China (2022–2028). He was elected a Fellow of the Royal Society of Chemistry (FRSC) in 2015. In 2017, he received the Glycerine Innovation Award, sponsored by the American Cleaning Institute and the National Biodiesel Board, in recognition of his contributions to glycerine-related research and innovation. His current research focuses on organic chemistry, sustainable synthesis, biomass valorization, catalysis, and continuous-flow chemistry, with particular interest in the development of innovative and sustainable routes to value-added chemicals from renewable resources.

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