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## The green catalytic processes special issue on the 6th International Congress on Green Process Engineering

This special issue of *Catalysis Today* entitled *Green Catalytic Processes* contains selected contributions in the field of Catalysis and Biocatalysis that were presented at the 6th *International Congress on Green Process Engineering* (GPE 2018). This edition of the GPE Congress was held between June 3–6, 2018 at INP-ENSIACET, in Toulouse (France). This is the continuation of a successful series of biannual international congresses, whose previous editions were held in Toulouse (France, 2007), Venice (Italy, 2009), Kuala Lumpur (Malaysia, 2011), Seville (Spain, 2014), Mont-Tremblant (Canada, 2016). The general presidency of this series of conferences is held by Martine Poux and Patrick Cognet from the National Polytechnic Institute (Toulouse, France), while Prof. Jean-Claude Charpentier (University of Lorraine, France) acts as their ambassador. In this GPE-2018, Prof. Patrick Cognet and Dr Martine Poux (Toulouse University, France) acted as Chairs (Fig. 1).

For this GPE-2018 edition, the congress activities also benefited from the collaboration of members of a broad scientific committee involving more 35 experts at the highest international level from 12 countries from all continents.

The Congress was attended by more than 250 participants, from academic research, applied research and industry from 28 countries from all continents, displaying a very active participation in the sessions and other conference activities, as was highlighted by the great attendance to the plenary lectures and oral presentations, as well as by the lively discussions around the poster presentations, etc.

The topics developed during the Congress were:

- ❖ Activation methods
- ❖ Process Intensification technologies
- ❖ Processes for biomass valorization
- ❖ Green product design and engineering sustainability
- ❖ Process design, modelling and optimization
- ❖ New reaction media and green solvents
- ❖ Biocatalytic processes
- ❖ Energy supply for intensified processes

They were distributed as follows:

The GPE-2018 has provided a unique opportunity to achieve a comprehensive vision of the different research efforts being carried out, currently, to achieve sustainability in the development of chemical processes, integrating those aspects evolving from an analysis from the point of view of chemistry with those from engineering to synergistically contributing to reduce their environmental impact.

A total of 4 plenary lectures, 16 keynotes, 71 oral communications and a hundred poster presentations were presented and gave rise to fruitful exchanges.

The opening of the congress took place in the presence of Professor

Laurent Prat, Director of INP-ENSIACET, Pierre Aimar, Director of the Laboratory of Chemical Engineering, Professor Gilbert Casamatta, President of the Institute of Technological Research Antoine de Saint-Exupery and Professor Jean-Claude Charpentier, GPE Congress Ambassador.

During his introductory lecture, Professor Roland Clift, Founding Director of the Center for Environment and Sustainability, University of Surrey - Guildford (UK), shared his 50-year career thinking on "Sustainability: Putting the Process into Context". He emphasized the need to find new ways to address sustainable development issues and to integrate the process into the thinking of economists. He insisted on questioning not the process alone but the process in its whole context. He illustrated his point of view by analyzing the life cycle of biofuel production in which different stages are sources of greenhouse gas emissions, water demand, modification of the natural environment ... Local production, close to the source of raw material, should be preferred before transporting products over long distances. Thus, sustainable development brings new economic and societal considerations.

Professor Pedro Lozano from the University of Murcia (Spain) presented a plenary lecture on "Clean biocatalytic processes in ionic liquids and supercritical fluids". The use of ionic liquids and supercritical fluids, as a non-aqueous reaction solvent for carrying out selective biocatalytic transformations, has considerably increased the possibilities of developing clean and sustainable chemical processes of industrial interest. The ability of ionic liquids to over-stabilize enzymes, coupled with the excellent properties of supercritical CO<sub>2</sub> for product dissolution and transport, creates synergy for the design of clean synthetic processes and leads directly to pure products. Pedro Lozano illustrated this with many examples.

François Monnet, VP Corporate R & I Executive at Solvay has enriched the debate by providing an industrial vision on Chemistry and sustainable development. During his plenary lecture entitled "Several nuances of green for a sustainable biobased chemistry", he focused on sharing the Solvay Group's vision of developing products from bio-resources in a context of sustainable development. One of the strengths of the Group is the analysis of the needs of its customers to offer them the best solution, and develop it from bioresources. François Monnet emphasized the ability to develop sustainable, innovative business in a sustainable world, while having a respectful use of the raw material. Avoiding the use of fossil carbon must also reduce our environmental footprint.

To close this event, Professor Krishna Nigam of the Faculty of Chemical Engineering, Indian Institute of Technology Delhi, India, focused on new technologies: "Green Process Intensification using Novel Device". During an enthusiastic presentation on the development of

innovative and energy-saving technologies from the Green Process, he focused his speech on the 'Coiled Flow Inverter' reactor, based on the concept of flow reversal. In particular, the analysis presented by Professor KDP Nigam showed that the CCFI reactor (Compact Coiled Flow Inverter Reactor) could not only serve as a passive mixer but also for many process applications where good radial mixing is required, while maintaining a narrow residence time distribution. He also emphasized that many discontinuous processes in the chemical industry could be transposed continuously for better process and product control. CCFI reactor can thus contribute significantly to the development of a broad spectrum of continuous chemical processes, pharmaceutical processes and bioprocesses.

In parallel, a "Speed" networking space was organized to allow delegates to discover the research activities of the Chemical Engineering Laboratory. Nearly 40 people were able to visit the laboratory's pilot facilities and meet the researchers.

Finally, Professor Jean-Claude Charpentier closed the event, presenting during his talk, a review of the scientific topics discussed throughout the conference. On this occasion, two prizes for the best posters were awarded on the last day by Stéphane Déchelotte, Chief Executive Officer of PROSIM S.A.

A selected number of the papers presented in oral form were asked to be submitted to the specific thematic Special Issues created at two renowned International Journals in the field. One of them at Green Processing and Synthesis (papers somehow related with green products, bioresources processing, etc.), and the second one at Catalysis Today (papers somehow related to catalytic and biocatalytic processes connected with Green processing). The participation at the corresponding Special Issue of Catalysis Today, here presented, has been one of the most numerous and of higher quality, revealing the relevance of

Catalysis, in its many different aspects, as an essential tool for developing Green Chemical processes.

This special issue, containing 17 of such papers, and which we feel represents a significant contribution and a valuable addition to the specialized literature on (bio)catalysis for green chemical processes, is our last contribution for the GPE 2018. In the words (and messages) of many participants, GPE-2018 was a great conference in all aspects. In this regard, the organizers and the Guest Editors would like to acknowledge all those that contributed to this success: the participants, the sponsors (with special thanks to the companies SinapTec and Prosim), the colleagues from the International Advisory Board who reviewed the submitted abstracts, the reviewers (many from outside the International Advisory Board) who carried out a strict reviewing process on the manuscripts submitted, and the authors of the presented papers, for their contributions and careful revisions.

Finally, we wish to express our gratitude to the editorial team of Catalysis Today, for their agreement to publish these papers related to GPE2018 and for their continuous and excellent assistance.

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