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Additional Information

CATALYSIS AT THE HEART OF THE CHANGES TO COME

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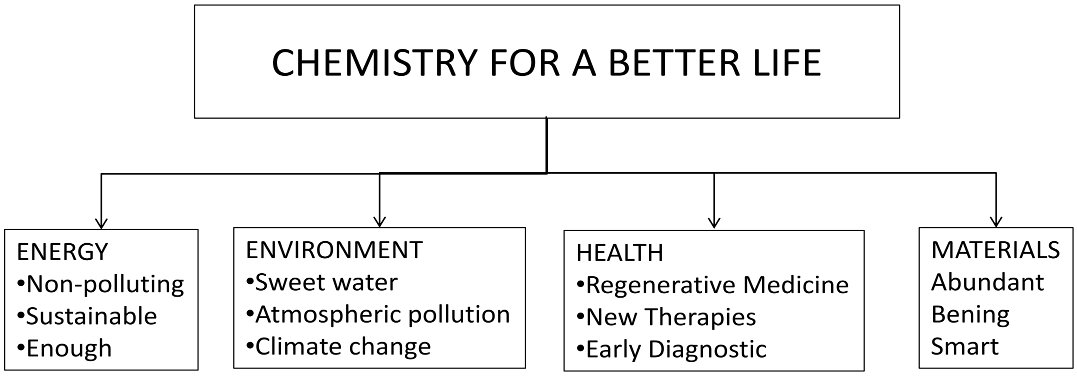
Catalysis has been directly involved in many of the achievements of Chemistry in the last Century from oil refining and petrochemistry to organic synthesis of new drugs and specialty chemicals. Surveys at the beginning of the XXIst Century have indicated that zeolites and their use as solid acid catalysts in the oil industry have been among the main achievements of the Chemistry of the last Century. Porous solids are still at the forefront of solid catalysts and the most recent interest in metal organic frameworks as solid catalysts is in a way a follow up of the continued research on porous materials, particularly aluminosilicates and mesoporous silicas. Widely assumed estimations indicate that about 80 % of all industrial processes are based on catalytic reactions and a similar high percentage of catalytic reactions can be assumed for organic synthesis at smaller scale.

However, besides the past remarkable success, the mankind is still asking for new chemistry for a better life and we are facing currently several urgent challenges. Particularly, chemistry should contribute to the development or improvement of the existing technology at least in four broad areas including: i) renewable energy, ii) environmental protection and climate change mitigation, iii) human health and biomedicine, and iv) novel smart materials (Scheme 1). Catalysis as a transversal discipline would be required to contribute to many of the emerging new processes, thus, there is new challenges and targets for the forthcoming years.



Scheme 1. Broad areas in which novel chemical processes are going to be required.

Among them, there are different processes in the area of renewable energy and the production of sustainable fuels that necessarily need the contribution of catalysis and there is currently a considerable effort of the catalysis community in this research field due the magnitude of the challenge and the short time to implement the new solutions. Research related to hydrogen storage and its release "*on-demand*", fuel cell operation, electro- and photocatalysis are developing faster than ever and the finding of durable and affordable catalysts is in some cases one of the major bottle necks that is limiting commercialization. These novel processes will push catalysis outside the conventional thermal-driven reactions, in where the energy to overcome the activation barrier is provided by heat to other much less-explored types of catalysis in where electric fields, photons, plasma or other sorts of energies are to promote the process. Considering the trend to electrification of chemical industry, direct use of electricity to perform chemical process can become under the spotlight, particularly electrocatalysis and plasma catalysis.

Biomass can contribute to fuel production in several ways, but, beyond the energy sector, celluloses and lignin can serve as sustainable and renewable feedstocks for bulk chemicals and the so-called platform compounds derived from biomass would surely have impact in the field of polymers and commodities. Also for biomass transformation, catalysts based on abundant elements are the key for a successful implementation of many of these processes. In fact, catalysis up to now has been largely dominated by transition metals, frequently those that are considered noble or critical metals such as Ru, Re, Os, In, Ta and rare earth metals. In the case of critical metals there are limited resources that are located in remote places. For the sake of sustainability and optimal use of resources, it would be convenient to develop "*atomically-precise"* catalysts in where the use of these costly metals is optimized to the maximum possible level, by using catalysts having isolated metal atoms or containing clusters with the exact number of atoms required to achieve the highest activity, controlling the stability of these labile clusters under reaction conditions by suitable metal-support interactions.

Replacement of noble metals for abundant base transition metals is a strategy that would also lead to diminish the dependency of catalysis on expensive and critical metals. A radically more innovative approach is the development of metal-free catalysts and, in this regard, *carbocatalysis* and, particularly, catalysis by graphenes constitutes an area that can be considered has started recently, showing its potential mainly for aerobic oxidations. Carbocatalysis is closely related to organocatalysis and both disciplines are interacting in mutual benefit. In fact catalysis by graphenes is sometimes denoted as *pseudo homogeneous*, since dispersed graphenes in a liquid medium represent a bridge between homogeneous and heterogeneous catalysis, having traits of both domains.

With regard to environmental protection and the climate change mitigation, CO_2 activation for the preparation of fuels and bulk chemicals from it is other general broad domain with much interest that needs efficient and selective catalysts to become economically feasible. The important role of catalysts in the automotive industry has been recently highlighted in the mass media due to the difficulty to decrease NOx emissions to meet current regulations and the new values for NOx emission that are going to be implemented in the near future are even much lower, requiring an additional effort in activity. Industrial waste water remediation, mainly based on the application of advanced oxidation techniques, also needs of efficient catalysts.

Catalysis is always interested in exploring the potential activity of new materials and one of the obvious applications in new materials can be in the field of catalysis.

This has occurred in the past with the large interest that metal organic frameworks has attracted due to their large surface area and porosity, the large diversity of transition metals that can be employed for the synthesis of MOFs, their high metal content and versatility in design. Similarly, novel carbon nitrides and carbon allotropes including graphenes are intensively explored as metal-free catalysts. Heterogeneous catalysis is has gain considerable capability due to nanomaterials, the control of matter at nanometric scale and the characterization tools developed in this area.

These and many other issues as well as the interplay of homogeneous and heterogeneous catalysis, the growing implementation of enzymatic catalysis to perform complex synthetic transformations for the preparation of pharmaceuticals as well as the general implementation of quantum chemical calculations and *in situ* techniques serve to exemplify that catalysis enjoys of good health and has a future more diverse and probably brighter than ever.

ChemCatChem as a specialized journal focused on catalysis should be an adequate mean for dissemination of all this massive research effort. The aim of the journal is to serve the scientific community by providing them a mean of publication of the best research in catalysis. To be the most useful, ChemCatChem has to maintain its strong reputation and leadership in the field, trying to increase the relevance, novelty and timeliness of the articles that appear in each issue. This can be achieved by the combined effort of authors submitting their best results to the journal, fair and diligent journal editors well aware of how the field is developing and the reviewers that should provide balanced reports. In my present case as elected chairman of the board for the next term, I am taken this position committed to serve the best I can to the scientific community and contribute, even in a very modest way, to the continued progress of ChemCatChem.