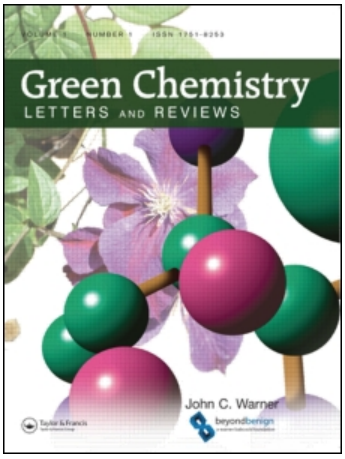

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Carles Estévez

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EDITORIAL COMMENT

The challenge of green chemistry

Carles Estévez

Associate Editor, IUCT Scientific Director

Green chemistry and engineering is vigorously changing the way we invent, manufacture and use chemical substances. Outstanding environmentally benign synthetic methods, reaction conditions, and safer chemicals have been developed since the Twelve Principles of Green Chemistry were formulated in the early 1990s. Today, the growing number of green chemical methods delivered by academic and industrial researchers enables companies to build strategies for green chemistry industrial implementation.

Industry, from small businesses to large corporations, has already made strategic moves towards sustainability by adopting the key elements of green chemistry. The development of less hazardous processes and commercial products, the shift from inefficient chemical routes towards bio-based synthesis, and the replacement of oil-based feed stocks by renewable starting materials are only a few examples of the major decisions taken that will ultimately have vast consequences for the world chemical markets.

The creation of industrial research consortiums, the adoption of green chemistry strategic research agendas, and the establishment of alliances between industry and specialized research centers in green chemistry and engineering are strong indicators that chemical companies are preparing for global competition in green chemical processes and products.

While green chemistry methodologies have been applied to virtually every aspect of industrial activity, much is still needed. Indeed, research efforts over the past decade have evidenced the formidable complexity of designing commercially viable and benign chemical products and processes. Reconciling nontoxicity with efficacy of function or environmental performance with industrial operability, to mention a few examples of simultaneously desired and often conflicting properties, are major challenges that need to be addressed.

When attempting to identify current barriers to translating green chemistry technologies to commercial manufacturing processes and products, it is envisioned that novel basic science linking molecular structure with chemical functionality could be a powerful means of further enhancing formal analyses of green molecular design. Second, as new fundamental synthetic knowledge emerges, it would make possible the adaptation of green chemistry industrial implementation to the almost infinite circumstances of the chemical industry. A third component is how innovative chemical engineering concepts can multiply the positive effects of green chemistry.

Cross-fertilization between green chemistry, nanotechnology, and biotechnology is expected to bring benefits to each individual scientific branch. By controlling matter at the nanoscale level, new nanostructures will enable unique catalytic selective transformations as well as functional materials to be designed beyond the current state of the art. Biotechnology has already proved to be a successful tool for the efficient production of bulk chemicals, specialties and pharmaceutical active ingredients. However, there is still room for innovations. Conversely, the application of green chemistry design principles may benefit both nanotechnology and biotechnology by providing, for example, less toxic and efficient nanomaterials as well as environmentally benign reaction conditions and purification methods for bio-based synthesis. This will make it possible for the research achievements in these fields to become commercial realities in the short term.

GCL&R is aimed at promoting and catalyzing the development of safer, better and cheaper chemicals, an unprecedented challenge that calls for the international chemical community to work together and co-operate to find ways around the existing implementation barriers. It is important to do this by increasing our fundamental knowledge on structure, property and function. Researchers in academia and industry are welcome to contribute to this section by submitting original papers that will certainly shape the green chemistry revolution over the next decade.

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