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Book review

Handbook of green analytical chemistry

Miguel de la Guardia and Salvador Garrigues (Eds.)
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Practical Approach Book
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The end of the 20th century has seen an increasing awareness regarding the environment and the impact chemistry has on it. In the field of synthetic chemistry and chemical engineering one of the relevant milestones of this course can be dated back to 1991, when the concept of green chemistry was first proposed by C. Cathcart. Since then, green chemistry proved to be a powerful concept with which significant steps have been taken in reducing the impact of chemistry on the environment. Similarly, at the very end of the 1990s, a parallel approach developed in the analytical chemistry field. The relevance of this green analytical chemistry approach can be easily emphasized using the words of the reviewed book itself: "[A] method recommended by EPA [...] requires 180 ml methylene chloride and 40 ml hexane, when such methods are routine hundreds may be performed daily".

This book, edited by two of the pioneers of the field, is a helpful tool for everyone who wants to get started with this topic, or that is interested in applying such methodologies in his own research/laboratory and improving his analytical routine.

Section 1 covers the topic in an introductory way, with chapter 1 giving most of the concepts in an easy-to-read manner. Chapters 2 and 3 are more devoted to academics, with descriptions on how to introduce the concepts in educational laboratories and experiments. Chapter 4 can be at first sight considered almost as academic following the style of the previous two chapters, but regardless the reader will find a rich and useful study of the literature. This can be useful not only if a publication is planned but also to improve the efficiency of specific bibliographic searches.

Section 2 starts the applicative part of the book, providing an extensive and detailed overview of how the analytical process can be "greened", in each of its steps.

Chapters 5 and 6 deal with the sampling methods (or the lack thereof), and chapters 7 and 8 are devoted to the sample preparation steps. Extensive "coverage" of these parts of the analytical process is provided, because huge amounts of chemicals and solvents are consumed during sample preparation and purification, and acting on these steps can readily reduce the environmental impact of the analysis.

Chapters 9 and 10 are devoted to techniques that have a great potential in terms of greenness, but that are not ready yet. First, capillary electrophoresis is described, underlining both the strengths and weaknesses of the method. The reader will also appreciate the fair comparison of the method with its most direct competitors (i.e., HPLC). Then liquid chromatography is presented, with interest devoted to the use of benign solvents and the chances of size reduction.

Chapters 11, 12 and 13 are related to spectroscopic techniques, and are probably among the most relevant for a reader which aims at a fast deployment of green analysis. This is because spectroscopic techniques are already some of the greenest analytical methods at hand, because "the samples are relatively small and sample pretreatment is often simple". The final chapter of the section is dedicated to electroanalytical methods.

Section 3 brings a more systemic approach, where aspects and methods are described in a wider framework. Here emphasis is not given to the techniques themselves but to improvements of the environmental impact that can be obtained via ameliorations of the analytical process itself. Chapters 15 to 17 deal with generalized energy saving of the process, automation and miniaturization methodology which can provide advantages due to the reduced scale or the improved precision of an automatic procedure. The topic is then scaled to portable lab on a chip devices and to the treatment of the waste that the analytical methods yield as byproducts (mainly with photoassisted methodologies).

The final section is the most applied, dealing with actual applications of the green analytical techniques discussed previously in the book. This section offers the reader a good selection of applied examples, related to: drug production, analysis of biosamples, environmental analysis and application, industrial deployment and process control, to name but a few.

In conclusion, this is an interesting book for a reader who wants to expand their views on the topic, being edited by two of the most prolific contributors in the field, and carrying contributions from worldwide renowned groups on the subject. All aspects of the analytical process are covered, from sampling to waste management, while keeping an eye on the practical deployment of the method.

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