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Advances in Chemical Bioanalysis

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Aims and Scope

Bioanalytical Reviews is the successor of the former review journal with the same name, and it will complement Springer's successful and reputed review book series program in the flourishing and exciting area of the Bioanalytical Sciences.

Bioanalytical Reviews (BAR) publishes reviews covering all aspects of bioanalytical sciences. It therefore is a unique source of quick and authoritative information for anybody using bioanalytical methods in areas such as medicine, biology, biochemistry, genetics, pharmacology, biotechnology, and the like.

Reviews of methods include all modern tools applied, including chromatography (in its various forms), capillary electrophoresis, biosensors, bioelectroanalysis, fluorescence, mass spectrometry, NMR, IR/Raman, and other optical spectroscopies as well as methods related to bioimaging. In particular the series volumes provide reviews on perspective new instrumental approaches as they apply to bioanalysis, and on the use of micro-/nano-materials such as micro- and nanoparticles. Articles on μ -total analytical systems (μ -TAS) and on labs-on-a-chip also fall into this category.

In terms of applications, reviews on novel bioanalytical methods based on the use of enzymes, DNazymes, antibodies, cell slices, to mention the more typical ones, are highly welcome. Articles on subjects related to the areas including genomics, proteomics, metabolomics, high-throughput screening, but also bioinformatics and statistics as they relate to bioanalytical methods are of course also welcome. Reviews cover both fundamental aspects and practical applications.

Reviews published in BAR are (a) of wider scope and authoratively written (rather than a record of the research of single authors), (b) critical, but balanced and unbiased; (c) timely, with the latest references. BAR does not publish (a) reviews describing established methods of bioanalysis; (b) reviews that lack wider scope, (c) reviews of mainly theoretical nature.

Frank-Michael Matysik

Editor

Advances in Chemical Bioanalysis

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Preface

This book is the first volume of a new series of chemistry review books focusing on bioanalytical chemistry. The new series, *Bioanalytical Reviews*, will cover cutting-edge tools used in modern bioanalytical research as well as new solutions to bioanalytical challenges. Methodological developments in bioanalytical chemistry have had an enormous impact on almost all areas of the life sciences. Consequently, *Bioanalytical Reviews* should attract interest from a wide cross section of the scientific community.

The mission of the present volume, *Advances in Chemical Bioanalysis*, is to reflect on the progress of important research within the rapidly growing and diverse area of chemical bioanalysis. Chemical bioanalysis is the scientific discipline of analyzing biological systems by chemical (rather than by purely biophysical or biochemical) methods. It retrieves selective information from complex biological systems. The following contributions have been prepared by experts from an international network in the field of chemical bioanalysis (CHEBANA). Among the methodological approaches in chemical bioanalysis three major areas were singled out for this volume:

- Fluorescence-based methods
- Electrochemistry
- Mass spectrometry

Representative in-depth reviews of research topics in chemical bioanalysis based on at least one of these concepts are as follows:

Quaranta et al. present an overview of recent developments in the field of optical sensing of oxygen providing a guide for selecting suitable oxygen indicators in the context of bioanalytical applications. The important bioelectrochemical research area of electron transfer between microorganisms and electrodes is reviewed by Patil et al.; Perez et al. summarize the progress made in the synthesis of monodisperse polymeric nano- and microparticles and their applications in chemical bioanalysis. New developments in upconverting phosphor labels in the context of bioanalytical assays and associated challenges are reviewed by Riuttamäki and Soukka. The role of periplasmic binding proteins as recognition elements for the

development of optical and electrochemical biosensors and corresponding applications is summarized by Grünewald. The contribution by Cindric and Matysik illustrates the hyphenation of electrochemistry with mass spectrometry and its potential for bioanalytical studies.

I wish to express my appreciation to all of the authors who contributed to this book project with high-quality articles illustrating the current strength and future potential of important bioanalytical approaches. Last but not least, I am deeply indebted to Prof. Otto Wolfbeis for his enthusiasm in forming an international consortium of experts to promote the advances in chemical bioanalysis.

Regensburg, Germany
Autumn 2013

Frank-Michael Matysik

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