

Preface

A strong demand exists for improving the control and automation of industrial processes and for monitoring specific analytes in hospital critical care services, environmental control, or even defense. Following key parameters in real time remains difficult, and on-site analysis, which is an alternative to time-consuming conventional analysis performed in central laboratories, is raising a great amount of interest.

New generations of sensors able to directly provide direct and immediate information on the composition of their surroundings are promising tools in this area. Among them, biosensors, which can be thought of as highly sophisticated chemical sensors incorporating some kind of biological material in a sensing layer intimately associated with a transducer, are very attractive. Based on the highly specific and sensitive biomolecular recognition of target analytes, they provide a transduced signal, generally electrical, that can be correlated, after calibration, to the concentration of the analyte present in a complex medium.

Enzyme electrodes are the archetype of the first generation of biosensors, and some of them are now commercially available.

New generations of biosensors are emerging. They are based on novel and promising transducers such as field-effect transistors or optoelectronic devices. Efforts have been made by different groups to improve the selectivity and sensitivity of the sensing layer, to explore new concepts in transduction modes, and to miniaturize both the probes and related smart-signal processing systems.

Even though the literature published on this subject during the last two decades is abundant, it is still quite difficult to develop a clear idea of the future of such devices by reading randomly gathered papers.

Our aim in preparing this book was to ask authors—all active in the field and selected for their expertise—to contribute chapters based on experimental facts, presenting the state of the art in their domain that can serve as a reliable basis for other researchers.

As a matter of fact, the main bottleneck in such an interdisciplinary area is the common language that has to be developed to bridge the gap between readers from different disciplines. For this purpose, we asked authors to be didactic and comprehensive using examples from their own work and presenting major and

relevant contributions they have identified in their field. Although it is particularly difficult in such a book to avoid overlapping as well as omissions, emphasis in each chapter is on the principle of measurement, the biological material used, the description of transducers, and characteristics and performances of the biosensors thus designed.

In our opinion, groups gathering specialists of biomolecular engineering, microelectronics, optronics, computer sciences, and automation capable of developing a comprehensive interdisciplinary approach may soon claim a decisive leadership in the field.

Finally, our hope is that reading *Biosensor Principles and Applications* will boost the constitution of such groups and will encourage young scientists to join this challenging and promising area in the near future.

Loïc J. Blum
Pierre R. Coulet