Biomimetic recognition elements for sensing applications

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Published online: 11 February 2012
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Chemical sensors have become an essential tool in our daily life. During recent decades their applications have rapidly expanded in many different areas, including point-of-care diagnostics, environmental pollution monitoring, quality and process control in industrial applications, agriculture monitoring, and in improvement of warfare threat detection and security to highlight a few.

A chemical sensor consists of two basic components: a physical “transducer” and a chemical (molecular) recognition system [1, 2]. The specific interaction between the target molecule (analyte, ligand) and the recognition element, typically a macromolecule or molecular assembly, in the course of a reaction, is known as molecular recognition [3]. In biosensors, a biological recognition element is placed in direct contact with the transducer and the inherent binding capabilities of such biochemical receptor determine the specificity and sensitivity of the device [4].

Despite the broad applicability of biosensors, the future of these devices requires further improvements in terms of selectivity, sensitivity, long-term stability, and reduced production costs. Therefore, correct selection of the recognition element, responsible for the molecular

recognition, is an important aspect of the implementation of any biosensor.

Natural receptor entities, for example, antibodies, enzymes, nucleic acids, peptides, tissues, and whole cells, have been extensively characterized and optimized for biosensing applications. However, broadening the scope of application of these devices is restricted by the limited stability of biomolecules under harsh conditions, limited availability, or high production costs. As a result, research in the field of artificial (synthetic) or engineered receptors has expanded substantially in recent decades [3, 5].

Mimicking nature has always been a very challenging task for researchers. Implementation of the functionality of natural recognition elements in man-made materials with increased ruggedness and regeneration ability will considerably broaden the range of application of current biosensors and enable a better understanding of the activity of biological systems.

This special issue of *Analytical and Bioanalytical Chemistry* gives an overview of the state-of-the-art of biomimetic receptors, i.e., recognition units that can be synthesized or engineered by mimicking the behavior of natural molecules, with particular emphasis on their applications to sensor development. Contributors have reviewed the applications of peptides, carbohydrates, engineered antibodies, engineered bacteriophages, genetically engineered proteins, aptamers, and molecularly imprinted polymers in combination with different transducers for various applications, including biomedical, food, or environmental analysis, to demonstrate the usefulness of these new tools in the near future for sensing applications.

I would like to express my deepest gratitude to all the authors for their outstanding contributions. Hopefully this

Published in the topical collection *Biomimetic Recognition Elements for Sensing Applications* with guest editor María Cruz Moreno-Bondi.

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collection of papers will stimulate further research on this topic for the sake of a cleaner environment, safer food, more affordable diagnosis, and a better quality of life.

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María C. Moreno-Bondi received a Ph.D. in analytical chemistry at Complutense University of Madrid (Spain) in 1990. She was promoted to full Professor at the Department of Analytical Chemistry of Complutense University in 2008. She received the Young Researcher's Award from the Spanish Society of Analytical Chemistry in 1993 and the Research Award in Analytical Chemistry from the Royal Spanish Society of Chemistry in 2010. Her main research interests include the development of optical

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