An electrochemical approach to biochip design: how to marry transducer surfaces with biomolecules

Wolfgang Schuhmann
Analytical Chemistry – Center for Electrochemical Sciences (CES);
Ruhr-Universität Bochum, Universitätsstr. 150; D-44780 Bochum, Germany

Immobilization of biomolecules on transducer surfaces is belonging to the most important aspect of biochip design. Evidently, it is most important to individually and selectively address individual areas of an overall transducer surface e.g. for selectively modifying individual electrodes out of an array with a variety of different biomolecules such as different enzymes, DNA target strands, proteins etc.

In order to achieve a localized and selective immobilization of biomolecules on electronically conducting transducer surfaces electrochemical methods are proposed which are able to address individual electrodes of an array. The electrochemical methods which will be described include

1. Electrochemical induced formation of conducting polymer films
2. Reductive deposition of diazonium compounds
3. Electrochemical induced deposition of polymer films by locally modulated pH-values
4. Electrochemical modulation of thiol-based self-assembled monolayers
5. Application of scanning-droplet cell and scanning electrochemical microscopy based techniques for local post-modification of immobilization layers of electrode surface