Preface

Surface plasmon resonance (SPR) has evolved into an exciting technique in biomolecular interaction analysis. The development of commercial SPR instruments has made the technique available to a wide scientific audience, and the number of publications in which the use of SPR is described is rapidly increasing. SPR is in use for many purposes from food quality control to the study of nanoparticles. Much research is now focused on developing new SPR-related applications, e.g., SPR imaging, SPR arrays, SPR fluorescence, and combinations of SPR with mass spectrometry and with electrochemistry.

Biomolecular interaction analysis is at the core of many research projects. In principle, the setup of an SPR experiment is simple: There is a sensor surface to which one of the interacting partners (the ligand) is immobilized; the other partner (the analyte) is added in a flow or cell-like compartment. The binding phenomenon is monitored in real time as a change in SPR angle.

An important issue is the choice of surface and the immobilization strategy. With SPR, it is possible to mimic the biological environment which is relevant for an interaction. For interactions in a water environment, sensor surfaces with hydrogels are available. Many biomolecular interactions take place in a membrane environment. For this, commercial sensor surfaces are available, or surfaces can be tailor-made. This volume contains several examples of building up of lipophilic surfaces. Nature abundantly makes use of multivalent interactions; multivalency can be mimicked on a sensor surface with immobilized ligands.

In composing this volume, we had users in mind who have access to commercially available SPR instruments. As mentioned above, new technology-driven SPR applications are emerging. These are fascinating and promising but mostly not widely commercially available yet, and therefore not prominent in this volume.

A broad variety of applications is presented. The volume aims to address a wide range of researchers (biochemists, molecular biologists, medicinal chemists, molecular pharmacologists, biophysicists) who would not like to use their SPR instrument as a “black box” but wish to be aware of the processes on and near the sensor that affect the outcome of SPR experiments. Therefore, this volume does not only contain protocol-based chapters but also chapters highlighting backgrounds of vital issues in using SPR, such as processes occurring within the hydrogel environment of sensors and one chapter focusing on lipid membrane surfaces. The information from SPR experiments is very information rich. It cannot only be used for affinity assays but also to gather kinetic information. Proper kinetic analysis may help to understand the binding mode, e.g., conformational changes, dimerization, or heterogeneity.

We expect that this volume fills a need for well-described hands-on SPR experimental protocols. It promises, however, more than details for implementing a described protocol: You may be inspired to develop adaptations to your own need and molecules. This is also how our authors started!

In their 2005 review of the literature, Rich and Myszka conclude that the quality and presentation of SPR work is often pretty poor (1). It is our conviction that this is caused by a lack of knowledge of the processes that influence the SPR signal. Hopefully, this volume
helps to create insight into the great possibilities and also limitations of SPR. Such insight promotes well-designed SPR experiments and adequate presentation in literature. More knowledge also inspires researchers to do more with the SPR signal than is now common practice.

We are thankful to our authors for their enthusiastic reaction to our invitation and for their cooperation and patience. Now overlooking the end result, we are impressed by the high quality of their contributions. It was a pleasure to collaborate with them.

Reference


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