AFFINITY BIOSENSORS BASED ON SURFACE PLASMON RESONANCE

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EXTENDED ABSTRACT

Since the first application of the surface plasmon resonance (SPR) phenomenon for sensing almost two decades ago, great strides have been made in this method both in terms of instrumentation development and applications¹. SPR sensor technology has been commercialized and surface plasmon resonance biosensors have become a central tool for characterizing and quantifying biomolecular interactions¹.

In this paper we review this development and present recent results of research into SPR sensors at the University of Washington, Seattle. Special attention is given to the following topics:

- New approaches and improvements in SPR sensor instrumentation;
- Applications of SPR optical sensors and biosensors.

The following new approaches and improvements in SPR sensor instrumentation are discussed: multichannel SPR sensors (configurations with parallel channel architecture² and configurations with spectral discrimination of sensing channels³) for potential multianalyte detection, compensation for background interference effects (temperature, non-specific binding) for more robust and reliable sensor performance, and sensor miniaturization for potential out-of-laboratory applications.

SPR sensor applications to be discussed include detection of foodborne pathogens such as bacteria and toxins. The research group at UW has developed a biosensor for detecting *Staphylococcal enterotoxin B* (SEB), a 28,000 molecular weight protein toxin. In order to allow for specific capture of SEB on the SPR sensor surface, a layer of monoclonal antibodies to SEB was immobilized on the sensor employing a gold-binding peptide method⁴. To improve detection limits of the SPR sensor, a sandwich assay was employed in which secondary antibodies were attached to previously detected (captured) toxin molecules, effectively increasing sensor response.

Experimental study has shown that the developed SPR biosensor could detect the presence of SEB in concentrations lower than 5 ng/mL (Figure 1).

Preliminary data on SPR biosensor-based detection of bacterial pathogens such as *Salmonella enteritidis* and *Escherichia coli* are presented. While it appears that direct detection of $10^6$ cfu/mL should be possible, the sensor response is slow, probably due mainly to slow diffusion of large bacteria to the SPR sensor surface.

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REFERENCES: