Advanced optical biosensors based on nano/micro technology

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Biosensors consist of biomolecular recognition elements and signal transducers. Biomolecules such as enzyme, antibody and DNA have excellent specificity and sensitivity for target molecules. Optical detection systems have been used as a signal transducers for biosensor development. This talk will focus on our examples of advanced optical biosensors based on nanotechnology and microchip technology.

1. Micro-fluidic antibody sensor for PCB based on sensitive fluorometric detection
Polychlorinated biphenyls (PCB’s) are persistent environmental pollutants, whose pose a threat to both the human and to the biosphere due to their toxic and endocrine disrupting effects. There have been lots of reports on PCB’s estimate sensors by several other groups in the literature. However, the presently available PCB sensing methods involve laborious, time consuming and needs high cost investment. So far, to best of our knowledge, there is no report available on Co-PCB sensing microfluidic device. In this study, we report a novel and simple Co-PCB microfluidic device with rapidity and high sensitivity.

2. Multianalyte immunoassay based on microfabricated encoded particle array
Sandwich immunoassay format was performed using antibody-immobilized particles, peroxidase-labeled antibodies and luminol-based chemiluminescence detection system. Three analytes, IgA, IgG and IgM were tested in the assay. The procedure of the assay is as follows: Separate sets of particles with an identifiable code were each tagged with a specific antibody. After combining of the sets of particles into a plastic tube, immunoreagents for a sandwich assay format were added sequentially. The immuno-treated particles were then applied to the array in a random fashion and finally detected using luminol-based chemiluminescence detection system with a CCD detector. The code signature identified the individual particles and, subsequently, the immobilized biocomponents at each specific location in the array.

3. Silicon microchamber array for sequence specific DNA amplification and detection
This topic describes on-chip DNA amplification in a highly integrated microchamber array. The 40 nL of PCR mixture was introduced into each chamber of the microarray precisely by using nL dispensing system through the oil layer that served as a coverlid. The amplified DNA was then detected with CCD camera built-in fluorescence microscope by using SYBR Green and TaqMan chemistry.

The details will be shown and discussed at the Conference.