초청강연4

Quantum Dot Conjugated Protein Chips for Clinical Applications

Yong-Hoon Cho

National Research Laboratory for Nano-Bio-Photonics, Department of Physics
Chungbuk National University, Cheongju 361-763, Korea

Microarrays of biomolecules such as DNA, RNA and proteins have proven to be a useful high throughput screening tool especially in the field of proteomics and genomics. Protein microarrays utilize microarrays of immobilized fusion proteins or antibodies. These kinds of chips are highly beneficial in the formulation of new drugs to fight against various kinds of diseases. For the purpose of optical detection in biochips, various types of organic dyes have been used for labeling purpose. In this study, we demonstrate the successful application of colloidal quantum dots (QDs), namely CdSe/ZnS QDs, for labeling of protein chips. QDs labeled hIgG and anti-hIgG protein microarrays (with spot diameter of 300 μm) were fabricated on aldehyde coated glass substrates, while nanoarrays (with spot diameter of 500 nm) were fabricated on silicon substrates by the dip pen nanolithography technique. The fluorescence emission arising from these microarray spots was detected with a microchip scanner. The nanoarray patterns were characterized by atomic force microscope and by a confocal microscope. Moreover, a comparative study of organic dye versus QDs conjugated microarrays was also conducted which highlighted the photostability as well as the photobrightening aspect of QDs as compared to organic dyes. Finally, we shall also show the potential application of colloidal QDs for real clinical applications. We demonstrate the fabrication and the detection of cancer protein biochips consisting of micro and nanoarrays whereby QD-conjugated prostrate specific antigens were used as clinical biomarkers for the detection of prostrate cancer.