Conjugated Polymer Biosensors

Dong June Ahn[1]* and Jong-Man Kim[2]

[1]Department of Chemical and Biological Engineering, Korea University, Seoul 136-701, Korea
ahn@korea.ac.kr, [2]Department of Chemical Engineering, Hanyang University, Seoul 133-791, Korea
jmk@hanyang.ac.kr

Polydiacetylene (PDA) supramolecules are interesting biomimetic materials in view of application to chemical and biological sensors. These conjugated supramolecules are unique in changing color from blue to red upon specific binding events, due to shortening of conjugation length of p-electrons along backbones. Various binding events including viruses, toxins, glucose, and ionic interactions have been reported detectible. However, simultaneous screening of various binding events has not been possible with solution-phase liposomes and solid-supported films of polydiacetylenes. As a first step to endow these systems with multiple-screening function, we were successful in immobilization of the polydiacetylene liposomes on solid substrates without losing their unique color changing property. It has been known that the 'blue-phase' polydiacetylenes are non-fluorescent while the 'red-phase' ones are fluorescent. It is surprising that not many works have been devoted to the development of polydiacetylene sensors based on fluorescence signals. In this study, we focus on fabrication of polydiacetylene supramolecule dot array patterns on solid substrates by using a conventional microarrayer. Each dot is found to possess the color-changing property as well as the fluorescence self-emission. This technique allows us, for the first time, to fabricate biochips based on polydiacetylene supramolecules. Label-free detection of small molecules and biological target analytes is demonstrated.