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Title	オンチップペプチドプローブ合成とin-situ非標識検出によるプログラマブルバイオセンサの開発
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Development of programmable biosensor by on-chip peptide probe synthesis and in situ label free detection

Abstract

Preparing and combating against for the worst case scenario, much research has been exploited to develop an effective yet simple biosensing system. Even so, the threats to the human race and the existence of others have been increasingly dangerous and endangered. Because of these potential threats, there is a great need for a system that can quickly, reliably, and accurately detect any contaminations in the environment or in the atmosphere. Biosensors have developed in the recent few decades, but these sensors are specific only to specific target molecule. Thus, programmable biosensor is proposed to flexibly use and detect various other target molecules during on-demand situation at any place.

To realize the proposed novel idea of programmable biosensor, simple and effective microchip system to be used for synthesizing peptide is initially developed. Very simple inlet and outlet microchannel with reaction chamber on the microchip is designed. Pillar-like structures at the reaction chamber is incorporated to be more effective while synthesizing peptides on microfluidic chip. The optimal conditions for on-chip peptide synthesis is studied here and successfully estimated. The optimum coupling reaction time for the developed system is 15 min and 5µl/min of flow rate is the optimum flow rate. Conventionally, coupling time of peptide synthesis is usually 2-3 hours.

Through vigorous consideration, 'programmable biosensors' is proposed here to flexibly change the target analyte by changing the probe molecule based on on-site and on-demand situation. This may be achieved by synthesizing short peptide as probe molecules on-chip following traditional Fmoc-SPPS strategy. Linear hepta-peptide probe (-NH-PPGQPHH-NH_2) to be synthesised on-chip (optimized coupling time of 15min at 5µl/min flow rate) is proposed here in this research and successfully performed in situ detection of the target biomolecule on the same microchip. Highly specific peptide probe containing HPQ sequence is synthesised on-chip and study the interaction of probe with streptavidin biomolecule.

A novel approach of quick and rapid synthesis of peptides on SPR gold surface is introduced in this research. In this, synthesising a short peptide on SPR sensor chip through surface modification chemically is focused. Short peptide, EYYY, a tetramer is synthesised on the modified CM5 sensor chip directly and study the interaction with an atrazine, a herbicide. Development of very sensitive and massive sample analytical device from around the world has been realised in many different fields.

Keywords: Programmable biosensor, microchip, on-chip SPPS, label-free sensor, Surface plasmon resonance