Artificial Protein Design and Development of Biolectronics Sensor for High Throughput Screening

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High throughput screening is very important technique for health check and drug discovery in progress of great aging society. In this background, we consider that development of two fields and their combination is a key of the future high throughput screening technologies. The first important field is an artificial protein design, which can make new molecular sensor. For example, we have already succeeded in making an artificial antigen, in which unnatural fluorescent amino acid was incorporated into a specific position to detect the target antigen molecule by fluorescence change at real-time measurement, with collaboration of Prof. Sisido (Okayama Univ.) and Prof. Hohsaka (JAIST). The example demonstrates that *in vitro* translation method using 4-base codon-anticodon pair is very powerful technique to design and synthesize unnatural mutant proteins which have super ability of molecular recognition and information transduction. The second important field is development of novel bioelectronics sensors. Recently, we have developed new bioelectronics sensors using a chemical CCD (C-CCD). C-CCD is a novel semiconductor sensor which was developed originally by HORIBA Ltd. and can detect surface potential in a solid-solution interface. We applied this new sensor to detect bio-affinity binding reaction on a CCD gate surface. DNA hybridization and antigen-antibody binding reactions were easily detected with this C-CCD sensor using no labeling. Furthermore, we found a gold-gate type C-CCD senses redox species with high sensitivity and is applicable to make redox enzyme sensor using electron mediators. As multi-channel C-CCD must be developed in near future by IC fabrication technology, these findings strongly suggests the C-CCD may be very promising device to develop a high throughput screening system in next generation.

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