Integrated Biocompatible Nano-Biosensor-Chip

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Recently, it has been critical issues a new paradigm of nano-bioscience, especially about nanobiosensor, neurobiosensor, neuroelectronic devices, neurochip, ion-channel for next generation medical. For practical nanobiosensor chip using nanoarchitecture, it is important meaning to devise nanopatterning with biocompatible materials by soft nanolithography technology in fuel cell biomimndimensional science of the bioengineering area. I have been tried to develop biocompatible materials based nanopatterning, self-assembly array, implantable nanobiosensor and nanoactuator to address challenging problem in nanobioscience. Micro/nanopatterning of biomolecules such as DNA, protein, and cells have been proven useful as high-throughput screening tools in proteomics, genomics, and the identification of new pharmaceutical compounds. The universal patterning techniques for producing submicrometer patterns are microcontact printing, x-ray interference lithography, nanoimprint lithography and capillary lithography. A critical point for the development of biomolecule nanopatterning is avoided the non-specific absorption among biomolecules on surface.

In this paper, I present the nanometric geometry of a well-oriented nanowell (ONW) array derived from nanofabrication technology which can be easily employed for digital detection with a high S/N ratio, miniaturization, integrated assays and single molecule analysis. In this geometry, most of the area of the Au electrode was covered with the blocking layer, and only a nanized gold surface becomes exposed to the open space above the ONW. We fabricated the self-organized nanopatterning of hydrogel as a platform of biomolecular nanoarray using soft capillary lithography. Ultraviolet curable mold consisting of functionalized polyurethane with acrylic group was fabricated. We also present a strong specific antibody-antigen interaction on a functional lipid-membrane vesicle (liposome, FLVs) modified gold surface using ONW array metrics. The interaction is described by electrochemical measurement, SPR, QCM, AFM. Additionally, we present simple soft lithographic methods for patterning supported lipid bilayer (SLB) membranes onto a surface and inside microfluidic channels. The patterned copolymer surfaces resisted non-specific adsorption of lipid vesicles allowing for adsorption of the lipid bilayers on the exposed regions of two dimensional surfaces and inside microfluidic channels in comparison to glass control. We believe these findings can be related to various liposome applications such as drug delivery system, electrochemical or biosensors and nano scale membrane function studies.

Keywords: Nano-Biosensor-Chip, Nanowell array,