European Cells and Materials Vol. 6. Suppl. 1, 2003 (page 90) ISSN 1473-2262
Poster ID: 408

SURFACE BIOENGINEERING FOR MICROANALYTICS AND BIOMATERIALS

H.Gao, S.Angeloni, F.Crevoisier, S.Guinchard & H.Sigrist

CSEM Centre Suisse d'Electronique et de Microtechnique SA, Neuchatel, Switzerland.

INTRODUCTION: Bioarrays – made of oligonucleotides, proteins or complex carbohydrates, viruses, cells or cell extracts - require the immobilization, preferably covalent, of differing molecular species, differing molecular structures or mixtures of different molecules on material- or transducer surfaces. Research and development in this interdisciplinary field lead to new products and create new markets.

A NOVEL TECHNOLOGY*: arrayon*® technology relies on the unique properties of the photolinker polymer OptoDex® to immobilize probe (bio-) molecules on material surfaces [1,2]. Light activation of OptoDex® leads to generation of highly reactive intermediates (carbenes) which form covalent bonds with biomolecules on any type of material. To attain this, probe (bio-) molecules are mixed with the photolinker polymer and applied to the surface. Subsequent activation with light leads to covalent irreversible binding of the probe molecules. This feature makes OptoDex® and its analogues versatile products for i) specific surface functionalization and ii) surface passivation. The technology sates fundamental requirements for the investigation of biological systems. It is applicable in genomics, proteomics, functional proteomics, metabolomics and cellomics.

APPLICATIONS: In one type of application, photolinker polymers are thin-film coated on blank platforms such as plain glass. Specific products are *arrayon*® PhotoChips: generic platforms for biochip manufacturing. PhotoChips are ready for microprinting of biomolecules. Immobilized biomolecules to date include proteins (allergens, antigens, enzymes, peptides), carbohydrates and nucleic acids. Photobonded enzymes remain catalytically active, allergens and antigens can be immunocomplexed, oligosaccharides respond to carbohydrate-specific lectins, and photobonded oligonucleotides hybridize with their complementary strands.

When used in a more specific way, photolinker polymers with specific chemical functional groups are immobilized on biochip platform resulting in *arrayon*® functional platform (Fig. 1).

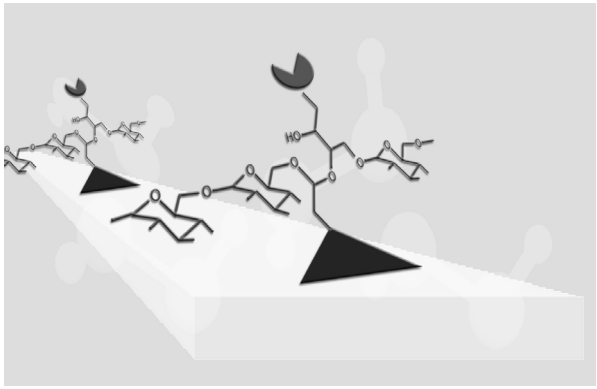

Fig. 1: Schematic representation of OptoDex® based functional platform. After photo-immobilization photolinker polymer provides secondary functional groups (amino-, carboxyl-, maleimido-, activated thiol- or biotin functions, lactose or fluorophores) that modulate the physical properties of the surface, and/or enable binding (covalent or affinity) of probe molecules.

OptoDex® is most beneficial for surface passivation [3] of any type of material. Passivation is a recommended or even mandatory treatment for surfaces that are prone to uncontrolled, heterogeneous or undesired physisorption. OptoDex® treatment unifies the surface properties of devices that are composed of different materials and renders them chemically uniform. Materials, bioengineered with *arrayon*® procedures withstand severe washing conditions and show low non-specific binding to ambient system components. This applies to *arrayon*® PhotoChips, *arrayon*® functional platforms, OptoDex® treated textiles and medical devices.

DISCUSSION & CONCLUSIONS: Exclusivity of the technology is challenged by a unique chemistry and its versatility. Wide-reaching applications open promising new markets, promoted by beneficial overall cost projections.

REFERENCES: [1]H. Sigrist et al. (1995) Opt. Eng. **34**:2339-2348. [2]N. Barié, M. Rapp, H. Sigrist, H.J. Ache (1998) Biosensors & Bioelectronics **13**:855-860. [3]M.Wiki, H. Gao, M. Juvet, R.E. Kunz (2001) Biosensors & Bioelectronics **16**:37-45.

ACKNOWLEDGEMENTS: This work was supported in part by the A. Köchlin Foundation.