SILANE MODIFIED POROUS SILICON OPTICAL DEVICES FOR IN SITU OLIGONUCLEOTIDES SYNTHESIS AND DETECTION

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Fabrication of biosensors has its main issue in bioconjugation, *i.e.* the immobilization of a working biological probe onto a solid surface. Bioconjugation represents a current challenge crossing both material sciences and biomedical applications. Lots of chemical protocols have been reported in literature in order to passivate and functionalize surfaces: the immobilization of biological species should not prevent their functions, and thus should also assure their correct organization and orientation. The standard example in this field is gold functionalization by self-assembled monolayer, which grants right distance from support surface and a strong binding to biomolecules. In case of silicon and silicon dioxide surfaces, organosilane reagents are commonly used to obtain passivation layers that can be successfully employed to attach protein or other biomolecules in easy way. Alkylsilanes, like 3-aminopropyltriethoxysilane (APTES) and 3-aminopropyldimethylethoxysilane (APDMES) can be linked to a hydrolyzed silicon surface through the formation of Si-O-Si bonds. The reaction is not trivial, and the quality of the interface is not always the same, depending on the silane and the procedure conditions. Recently, we have demonstrated in situ synthesis of oligonucleotides on the surface of porous silica structures, characterized by optical monitoring [1]; the advantages of in situ synthesis with respect to ex situ immobilization are not only the increasing of DNA probe density but also the process automation, and the possibility of surface local functionalization. Porous silicon (PSi) is obtained by electrochemical partial etching of crystalline silicon; it is characterized by very high specific surface, up to hundreds of m^2/cm^3, and is largely used for chemical and biological sensing. Unfortunately, the PSi structures suffer instability from oxidation and corrosion in aqueous solutions, especially simulating biological conditions. Many strategies have been developed to stabilize PSi for applications in the fields of biotechnology and biosensing. In this work, we have studied the stabilization of oxidized PSi multilayers functionalized by APTES and APDMES, and compared the effectiveness for in situ oligonucleotides synthesis and hybridization [2]. Our findings demonstrate that even if APDMES forms a thinner silane layer with respect to APTES, it assures good chemical stability to PSi support on exposure to corrosive

environments and greater functionalization coverage.

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