THE USE OF PHOTOLABILE OLIGONUCLEOTIDES TO FABRICATE PATTERNED SURFACES

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There is a large interest in the use of the self-assembling properties of biomolecules in nanotechnology. Biomolecules are seen as the ideal candidate to build next generation biosensors and for the fabrication of a variety of 'bottom up' nanoscale devices.

Among biomolecules, oligonucleotides have captured a large part of this interest [1-3]. The facile synthesis and modification of oligonucleotides make it easy to graft to surfaces and the relatively high physiochemical stability allows easy handling under ambient conditions. The sequence specific hydrogen bonding allows programming of structures with a simple four letter alphabet; C, G, T, A.

For the fabrication of biosensors and nanoscale devices the precision engineering and positioning of nanoscale building blocks, such as oligonucleotides, will be required. Photolithography is currently the most popular method for the fabrication of micro and nano-electronics, recently having being used to engineer 32nm sized features[4]. Recently it has been shown that short oligonucleotides can be synthesized on a silicon substrate using modern photolithographic techniques. These high density DNA chips have been successfully used for rapid DNA sequence analysis.[5,6]

In the present communication we study the use of oligonucleotides carrying photolabile groups in their sequence as a new kind of biological resist to form patterns on surfaces. To this end, a method for the fabrication of patterned surfaces using hairpin oligonucleotides carrying photolabile groups is described. A photolabile group has been introduced at the loop of an intramolecular oligonucleotide hairpin. The photolabile oligonucleotide was immobilized on glass and SiO_2 surfaces. Photolysis results on the formation of areas carrying single-stranded DNA sequences that direct the deposition of the complementary sequence at the photolyzed sites, fig 1.

References:

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Figures:

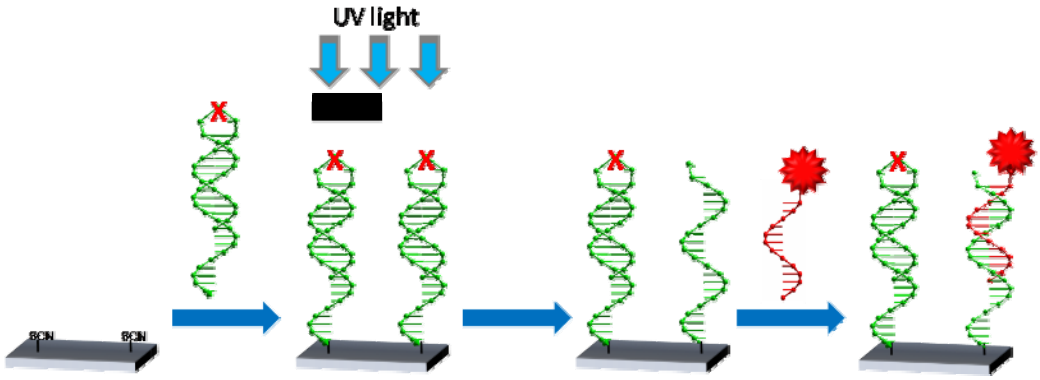

Figure 1 Scheme for the immobilization and patterning of hairpin oligonucleotides