

Microcontact Printing of DNA on Various Functionalized Monolayers

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INTRODUCTION: Microcontact printing of DNA has been developed in the past few years, as a cheap alternative to the common techniques used in the fabrication of DNA microarrays. It has been successfully applied for the attachment of single strands of oligonucleotides on various surfaces, and the efficient hybridization has also been demonstrated on these systems [1,2]. Our goal is to further develop this method, in order to control precisely the printing process of oligonucleotides.

METHODS: Two different types of functionalized glass slides have been synthesized, using a first step of self-assembled monolayer formation. They possess either an isothiocyanato, either an aldehyde endgroup (see fig.1), which will allow the covalent attachment of amino-modified oligonucleotides.



Fig. 1: Scheme of the two functionalized glass surfaces used for the microcontact printing of oligonucleotides.

The microcontact printing of 15 bases-length oligonucleotides has been conducted on these surfaces, using a PDMS stamp chemically modified with an amino-terminated dendrimer [3]. The inking and printing times, as well as the temperature of printing, have been varied in order to study their influence on the printing process. Finally, hybridization has been conducted directly onto the surfaces. The surfaces have been characterized with contact angle measurements, ellipsometry, XPS and fluorescence microscopy.

RESULTS & DISCUSSION: Figure 2 shows a microscopic fluorescence image of a glass slide which has been functionalized by microcontact printing with a single-stranded fluorescein-labeled oligonucleotide.

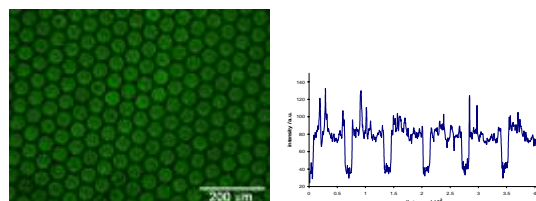


Fig. 2: Fluorescence image and associated intensity profile of a functionalized glass slide microcontact printed with fluorescein-modified ss-DNA.

Upon hybridization with an unlabeled complementary c-DNA, and depending on the conditions of the printing step, the intensity profile can be maintained. When the c-DNA is labeled with a Cy5 fluorophore, the corresponding red fluorescence image is obtained, demonstrating that the hybridization has occurred.

CONCLUSIONS: Microcontact printing of ss-DNA with covalent attachment has been successfully demonstrated on two different kinds of surfaces. In addition, work is conducted in order to quantify the amount of DNA transferred onto the surface, depending on the different printing conditions used.

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