OPTICAL DETECTION OF DNA HYBRIDIZATION ON CARBON NANOTUBES

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Single-walled carbon nanotubes (SWNTs) have outstanding properties and are being studied for applications in very different fields. One of the most promising applications is in the field of biomedicine where are being utilized as components of DNA, protein biosensors, drug delivery, gene therapy and scaffolds for neuronal growth [1].

SWNTs have protein affinity, and streptavidin non specific adsorption onto nanotubes surface haS been demonstrated [2] in previous studies. Using this fact and the highly specific interaction between biotin and streptavidin, in this comunication the streptavidin has been used as interlinker between SWNTs and a single stranded DNA modified with biotin. Streptavidin has been adsorbed on purified SWNTs and a single sequence of DNA (CTCGATGACTCAATGACTCG) has been attached to the SWNTs by means of biotin streptavidin bonding. Finally the hybridization with the complementary DNA sequence (CGAGTCATTGAGTCATCGAG) marked with Alexa 555 ® has been carried out (Figure 1). A control experiment has been performed by adding the complementary DNA strand labelled with Alexa 555 to the SWNTs-Streptavidin. It has been determined that the complementary sequence does not join the SWNTs when the biotin is not present.

Aqueous solutions of SWNTs with the complementary DNA sequence has been transferred to glass slide using PDMS stamp and fluorescence has been observed after DNA hybridization (Figure 2).

The possibility of using CNTs- Streptavidin as linker for DNA has been demonstrated and the optical detection of DNA hybridization has been performed. Specific bonding of complementary DNA strands can be used for optical detection of specific sequences. False positive hybridization due to non-specific adsorption of the ssDNA on the nanotubes surface has been discarded.

As SWNTs have been probed to enter the cell [3], this strategy can also be followed to detect the delivery of DNA or RNA sequences into cells.

References:

[1] Bianco A., Kostarelos K., Partidos C.D., Prato M. *Chem. Commun.* **2005**, 571

[2] Gonzalez M., Tort N., Benito A.M., Maser W., Marco M.P., Martínez M.T.; *J. Nanosci. Nanotechnol.* accepted January 2009.

[3] N.W.S. Kam, T.C. Jessop, P.A. Wender, H.J. Dai; *J. Am. Chem. Soc.* **2004**, 126, 6850

Figures:

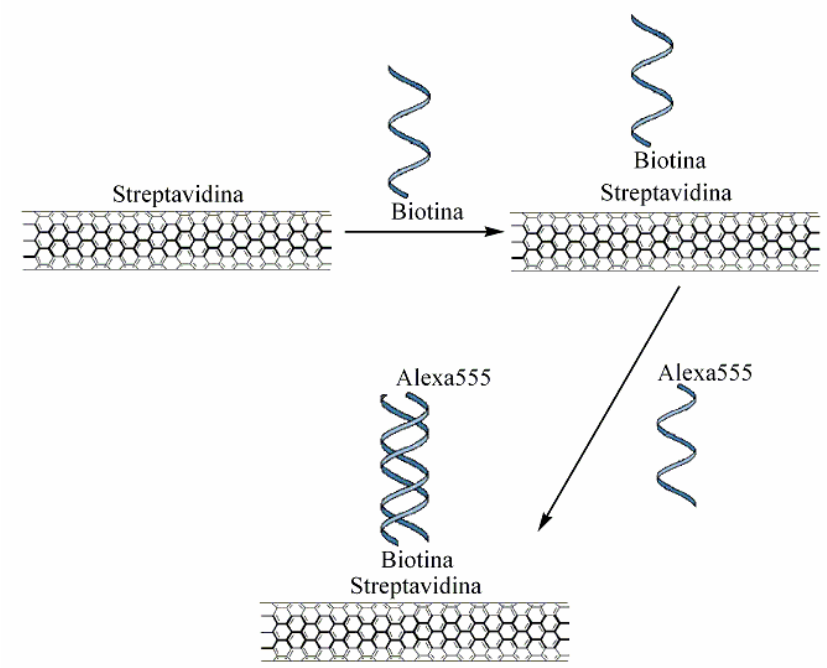

Figure 1. Scheme of DNA hydridization on SWNTs

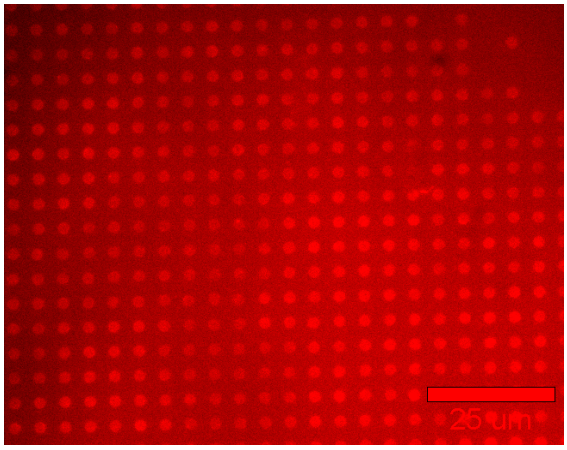

Figure 2. Fluorescent image of imprinted hybridize DNA SWNTs