

## IMMOBILIZATION AND DETECTION OF FUNCTIONALIZED NANOCONTAINERS ON (PATTERNED) SURFACES.

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**INTRODUCTION:** The focus of the project is to develop chips carrying immobilized native or artificial lipidic or block copolymer vesicles (termed "nanocontainers") for the rapid detection, identification, and manipulation of biological compounds. In a first stage, a general, one-step method for modifying surfaces of different types of vesicles was investigated. The method was based on coating negatively charged vesicles with functionalized Poly(L-Lysine)-g-poly(ethylene glycol) (PLL-g-PEG), a polyelectrolyte with a positively charged backbone which forms protein-resistant ("stealth" [1]) layers. Applications of this strategy to immobilized and free vesicles are summarized in this Poster.

### METHODS:

- Quartz Crystal Microbalance with dissipation measurement (QCM-D, QE301/QAFC301 from Q-Sense AB, Göteborg, Sweden).
- Confocal Laser Scanning Microscope (CLSM 510 Carl Zeiss, Oberkochen, Germany).
- Atomic Force Microscopy (Nanoscope IIIa, DI, San Diego, CA). Measurements were performed in liquid, in contact mode.

**RESULTS:** Our approach for immobilization focussed mainly on the so-called "docking sites" technique [2], combined with the coating of vesicles with PLL-g-PEG.

The docking sites build-up starts with the coating of a metal oxide surface with biotinylated PLL-g-PEG and the subsequent binding of streptavidin to the biotinylated surface (Figure 1). Biotinylated polymeric and/or lipidic vesicles are then immobilized on the streptavidin layer.

Figure 1 illustrates the immobilization of negatively charged, biotinylated lipidic vesicles on docking sites and subsequent modification with PLL-g-PEG. The process was followed by Quartz Crystal Microbalance with Dissipation (QCM-D), which permits the layer-by-layer build up of the surface to be followed *in situ*. The docking sites technique is very versatile and can easily be combined with patterning methods such as Selective Molecular

Assembly Patterning (SMAP) [3], for example for sensor applications.

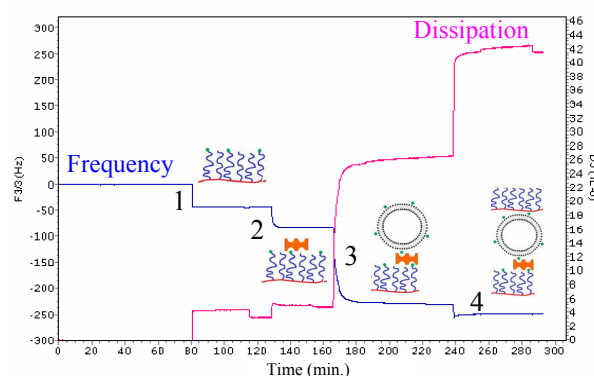
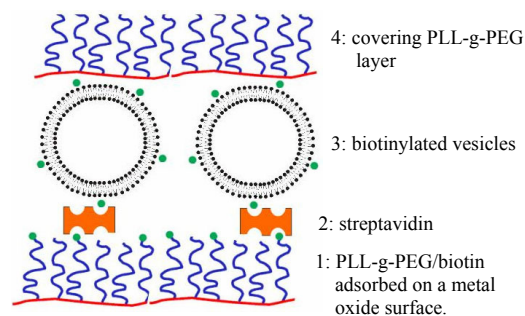


Fig. 1: Schematic diagram of biotinylated vesicles immobilized on docking sites and covered by a protecting PLL-g-PEG layer (top). The experiment was followed by Quartz Crystal Microbalance with Dissipation (bottom).

**REFERENCES:** <sup>1</sup>MC Woodle, DD Lasic, *Biochim. Biophys. Acta*, **1113**: 171-199 (1992). <sup>2</sup>N-P Huang, J Vörös, SM De Paul, M Textor, ND Spencer, *Langmuir* **18**(1): 220-230 (2002). <sup>3</sup>R Michel, JW Lussi, G Csucs, I Reviakine, G Danuser, B Ketterer, JA Hubbell, M Textor, ND Spencer, *Langmuir*, **18**(8), 3281-3287 (2002)

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