Identification and Immobilization of Biological Receptor Molecules for Nanowire-based Biosensing

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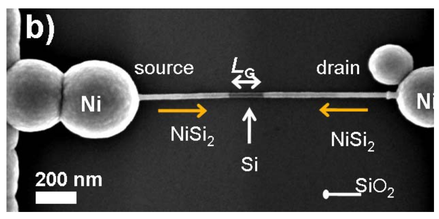
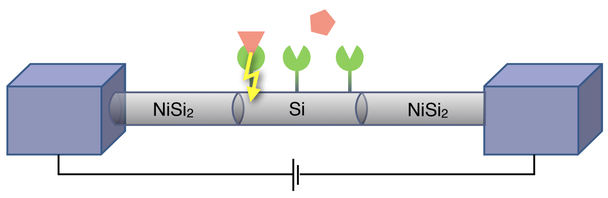
Motivation



$NiSi_2$ nanowire-based FET [1]

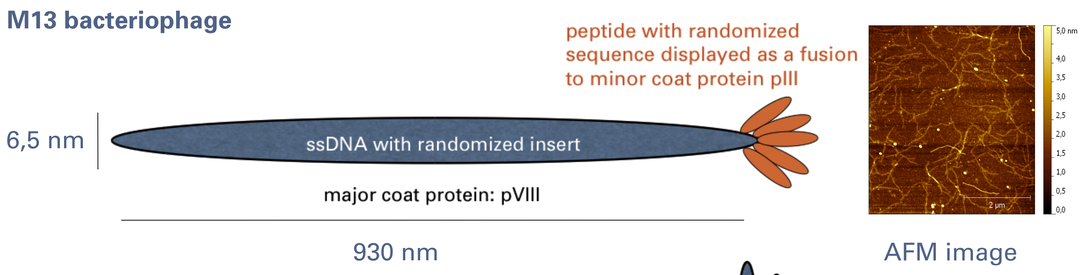
Why Nanowire-based Biosensing?
- 1D nanostructure
- high surface-to-volume ratio
- binding of target molecule → change in electron transport properties



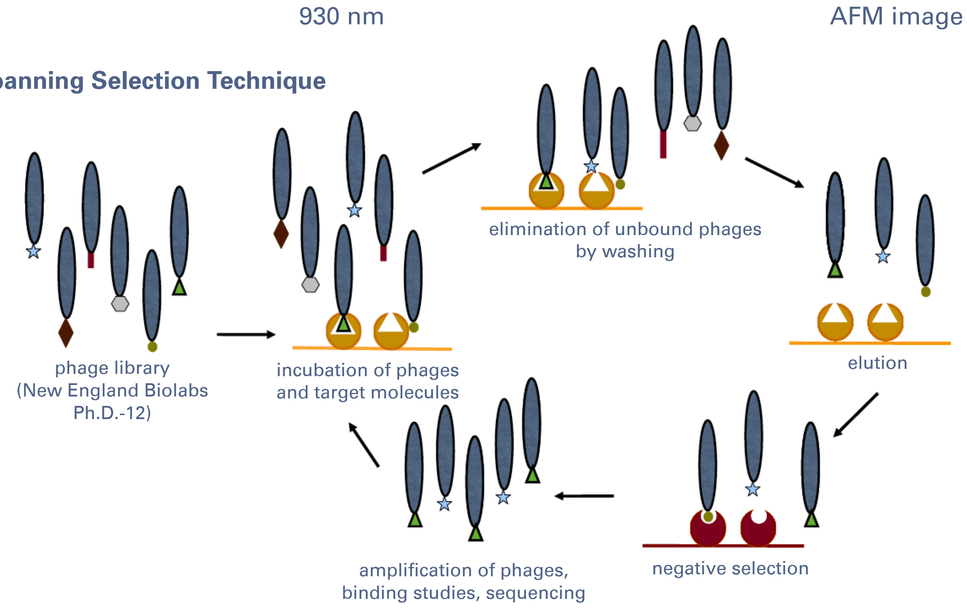
➡ **target: virus proteins**
➡ **identification of peptides as small receptor molecules by phage display**
➡ **silicon surface functionalization**
➡ **immobilization of receptors**

Identification of Receptors - Phage Display and Biopanning

M13 bacteriophage



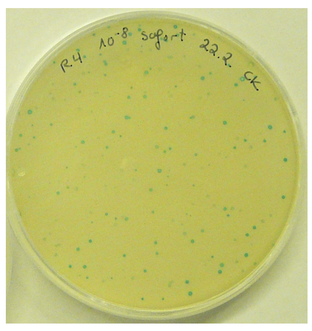
Biopanning Selection Technique



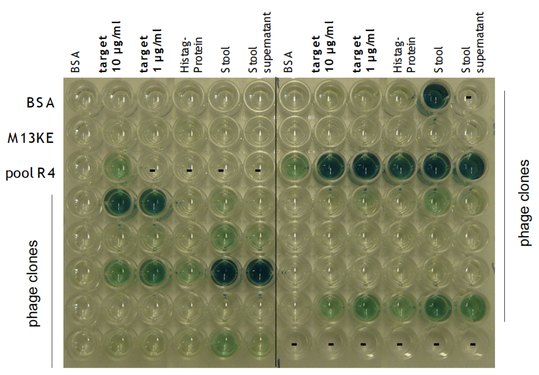
Immobilization of target molecules during biopanning
- round 1 and 3: His SpinTrap™ column
- round 2 and 4: Nunc MaxiSorp™ 96 well plate

Characterization of Individual Phage Clones

Isolation and amplification of individual phage plaques

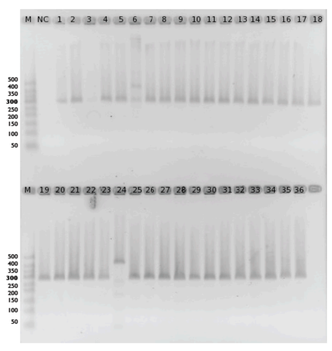


ELISA after round 4



→ ELISA signal strongly dependent on phage concentration and binding affinity, but reproducibility has to be improved

Sequencing of Phage-Displayed Peptides



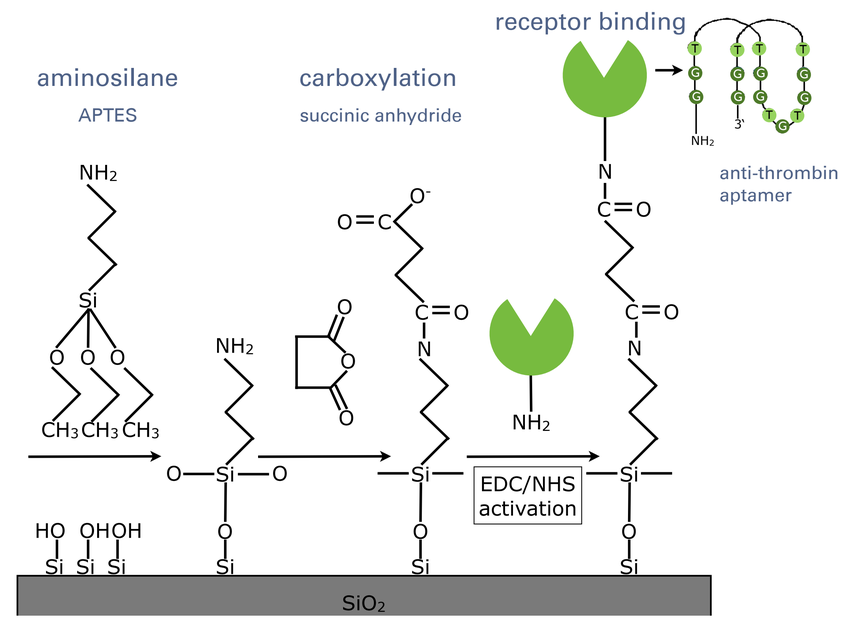
- PCR and gel electrophoresis of enriched phage library inserts
- sequencing result:
  35 of 36 sequences analyzable
  23 different sequences

Outlook

→ **further binding studies of most promising candidates**
→ **immobilization of peptides for nanowire-based biosensing**

Immobilization of Receptors - Functionalization

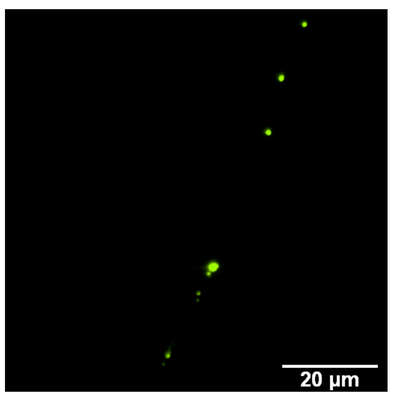
Immobilization of receptor molecules: DNA aptamers



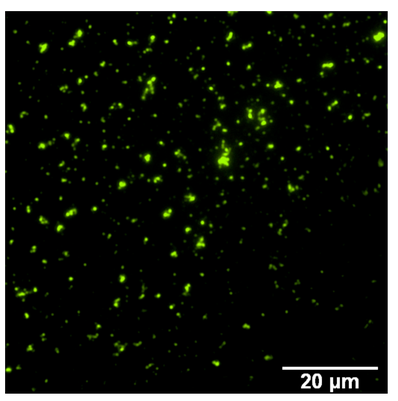
Fluorescence microscopy

optical detection of anti-thrombin aptamer bound to reactive carboxy surface with FAM*-modified aptamer

*FAM - carboxy-fluorescein dye



no fluorescence on non-functionalised Si wafer



high density of fluorescent dots
→ **successful aptamer binding** to functionalised reactive surface

References and Contact

[1] W.M. Weber et al., Nanotechnology 2008, NANO '08. 8th IEEE Conference on, 580-581

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