

Supporting information

Optical Biosensors for Bacteria Detection by a Peptidomimetic Antimicrobial Compound

Elena Tenenbaum^a and Ester Segal^{a,b*}

*^aDepartment of biotechnology and Food Engineering, Technion – Israel Institute of
Technology, Haifa, Israel*

*^bRussell Berrie Nanotechnology Institute, Technion – Israel Institute of Technology,
Haifa, Israel*

Corresponding Author

*E-mail: esegal@tx.technion.ac.il

Tel: +972-4-8295071. Fax: +972-4-8293399.

Figure S1 presents high-resolution scanning electron microscopy images (HRSEM) of thermally oxidized PSi, depicting the porous nanostructure.

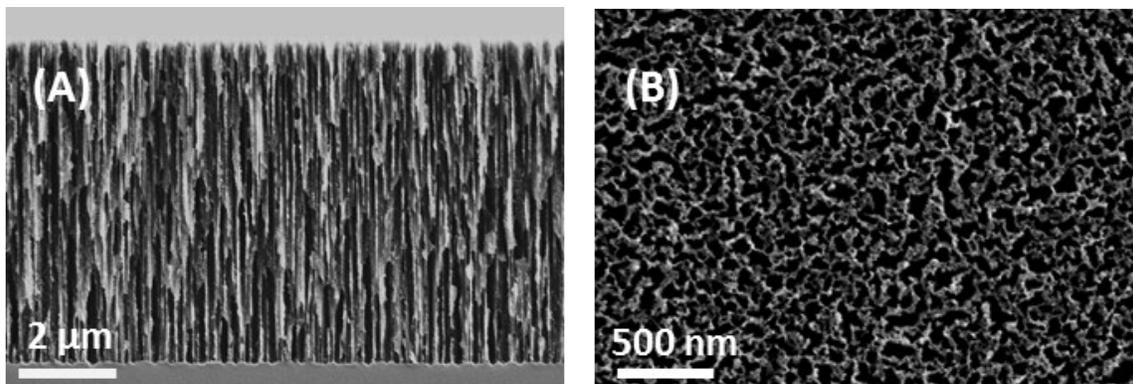


Figure S1: HRSEM images of a typical oxidized PSi (PSiO₂) film fabricated by anodization at current density of 385 mA cm⁻² for 30 s. (A) Cross-sectional view; (B) top view. The porous layer thickness is 7880±60 nm with cylindrical pores with an average diameter of 80±10.

The structural properties i.e., thickness and porosity, of the PSiO₂ films are characterized by three methods: HRSEM, gravimetry (for porosity) and the spectroscopic liquid infiltration method (SLIM), as we previously described¹. These results are summarized in Table S1.

Table S1: Thickness and porosity of the PSiO₂ films.

Etching conditions		HRSEM		Gravimetry	SLIM	
Etching time [s]	Current density [mA cm ⁻²]	Pore diameter [nm]	Thickness [nm]	Total porosity [%]	Open porosity [%]	Thickness [nm]
30	385	80±10	7880±60	78±2	64±10	7863±142

Figure S2 presents the coupling chemistry employed for the conjugation of carboxyl-terminated peptide to the thiol-modified PSiO₂ surface.

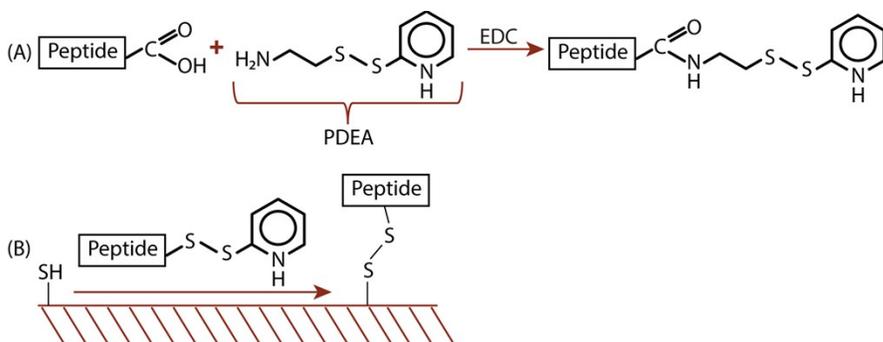


Figure S2: (A) Reaction with 2-(2-pyridinyldithio)ethaneamine (PDEA) in the presence of Ethyl-3-(3-dimethylaminopropyl)-carbodiimide (EDC), introduces reactive disulfide groups onto the carboxyl residue of the peptide. (B) Coupling occurs through thiol-disulfide exchange with the thiolated PSiO₂ surface.

Figure S3 presents a detailed scheme of the experimental set-up employed for the optical biosensing experiments.

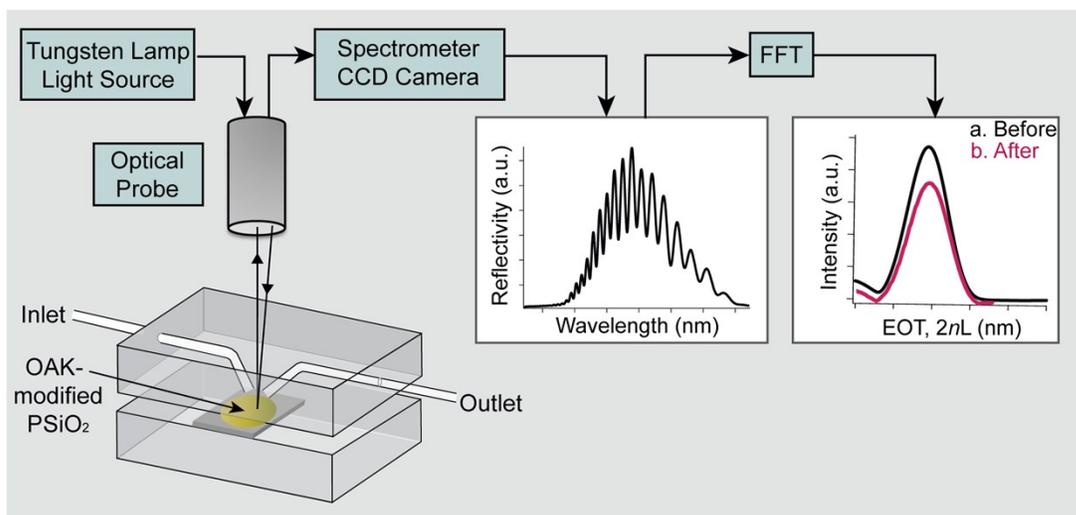


Figure S3: Experimental set-up used for optical reflectivity measurements. The OAK-modified PSiO₂ is fixed in a custom-made Plexiglas cell. The light source illuminates the surface and the reflected light is collected by the charge-coupled device (CCD) spectrometer. The obtained interference reflectivity spectrum is analyzed after applying fast Fourier transformation (FFT), which results in a single peak. The peak intensity, which is decreased after the introduction of

bacteria to the sample (red trace), is monitored real time during the biosensing experiment. Schematics are not drawn to scale.

Figure S4 presents the results of a biosensing experiment, in which the OAK-modified P SiO_2 is exposed to *E. coli* (10^5 cell mL^{-1}) lysate suspension. Upon introduction of the suspension, a rapid and significant decrease in the intensity is observed (Fig. S4A); while, the corresponding relative EOT value remains constant throughout the experiment (Fig. S4A).

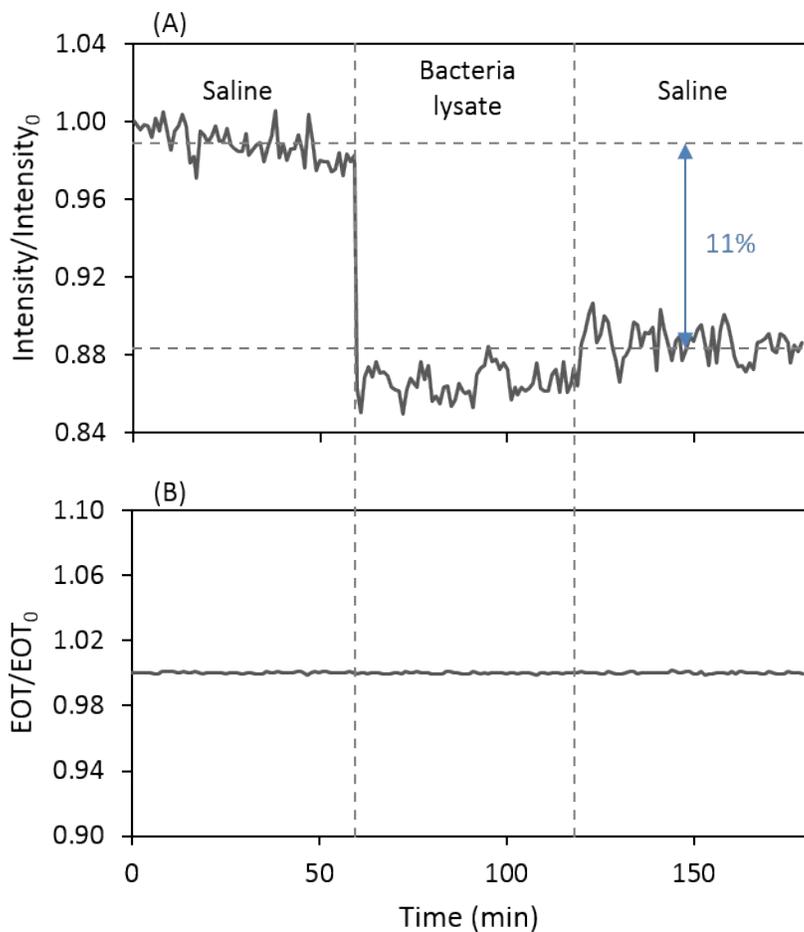


Figure S4: Optical biosensing experiment results of OAK-modified P SiO_2 exposed to *E. coli* bacteria lysate (10^5 cell mL^{-1}). (A) Relative intensity vs. time; (B) Relative EOT vs. time.

Reference

1. Massad-Ivanir, N.; Shtenberg, G.; Tzur, A.; Krepker, M. A.; Segal, E. Engineering Nanostructured Porous SiO(2) Surfaces for Bacteria Detection via "Direct Cell Capture". *Analytical Chemistry* **2011**, *83*, 3282-3289.