

Electronic Supporting Information (ESI)

Bacterial viability on chemically modified silicon nanowire arrays

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1. Analysis of SiNWs surface

1.1 SiNWs surface analysis with XPS

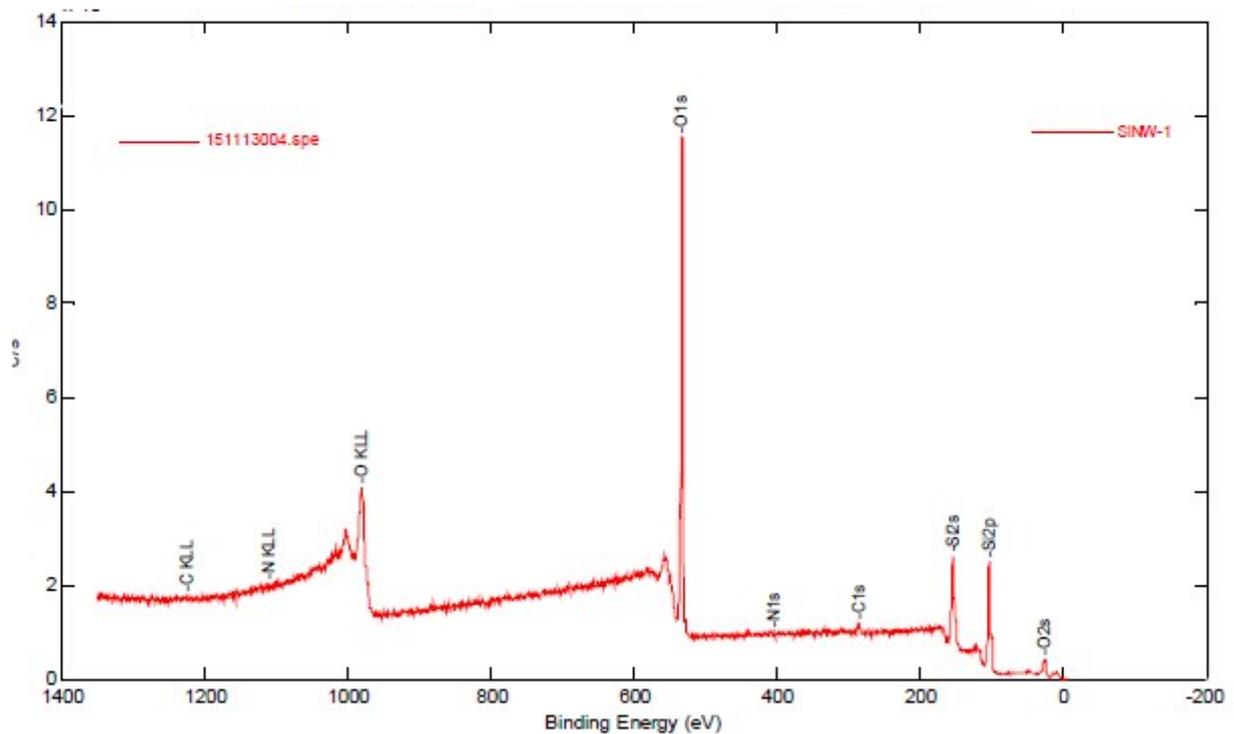
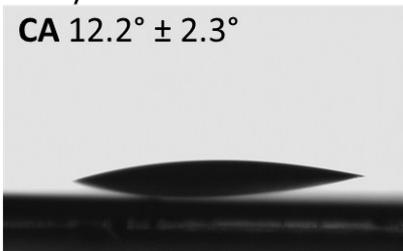


Figure S1: XPS spectra of SiNWs surface.

1.2 Contact Angle Measurements on SiNWs

CA-measurements are carried out on a Dataphysics OCA-20 contact angle system (2 μ l DI-water droplet, sessile mode). Average values for 3 measurements for each sample/configuration are reported.

as synthesized
CA $12.2^\circ \pm 2.3^\circ$



clean
CA $5.1^\circ \pm 0.63^\circ$



Figure S2: CA-images on SiNWs as synthesized (20 min MACE) and after overnight cleaning with nitric acid.

Table S1. Physical chemical properties of silicon nanowires

Surface	SiNWs	bSi [‡] as-etched	bSi [‡] after removal fluorocarbon residue
Contact angle ⁺	5°	80°	38°
O/Si ratio ^{&}	64.3:32.3	7.0:15.5	27.8:28.1 to 57.7:35.0
F-content [%] ^{&}	0.24	51.2	3.8 to 28.2
Diameter	143 ± 24 nm	50-250 nm	50-250 nm
Interspacing [†]	77 nm ± 16 nm	60-300 nm	60-300 nm
Height	11.3 ± 0.2 μm	450-850 nm	450-850 nm

[‡]fabricated black-silicon following Ivanova *et al.* Nature Communications (2013) 4, 2838; ⁺with DI-water, [&]based on XPS analysis; [†]between adjacent nanostructures

Some SiNWs properties are shown in table S1. We have compared SiNWs substrates with two home-made black silicon surfaces (bSi): (1) as-etched and (2) after removal of fluorocarbon residue. These samples were fabricated by using deep reactive ion etching (DRIE) using a Bosch-process (i.e. SF₆ and C₄F₈ as etch and passivation gasses) as reported by Ivanova *et al.* Nature Communications (2013) 4, 2838. As-etched bSi surfaces show a contact angle (CA) of 80°, which reduced to ~ 38° after removal of fluorocarbon residue remaining from the DRIE-process (due to dissolution of fluor traces). Elemental analysis of nanowire-surfaces, display a (much) lower O/Si ratio for the bSi-samples (in particular prior to fluorocarbon removal) in comparison with the SiNWs-surface. These results confirm that accurate chemical characterization of the surface is important for the interpretation of wettability experiments.

2. Analysis of bacterial morphology on SiNWs surfaces

2.1. *E. coli* colonization on flat silicon surfaces

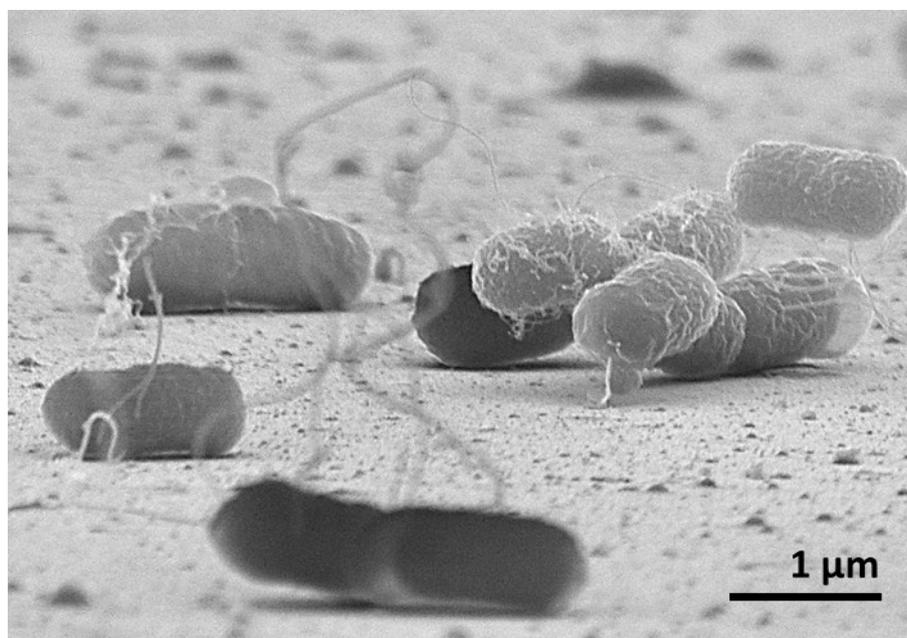


Figure S3. Representative SEM image of *E. coli* colonization of flat silicon surface after 8h culture.

2.2. *S. aureus* colonization on non-functionalised SiNWs arrays

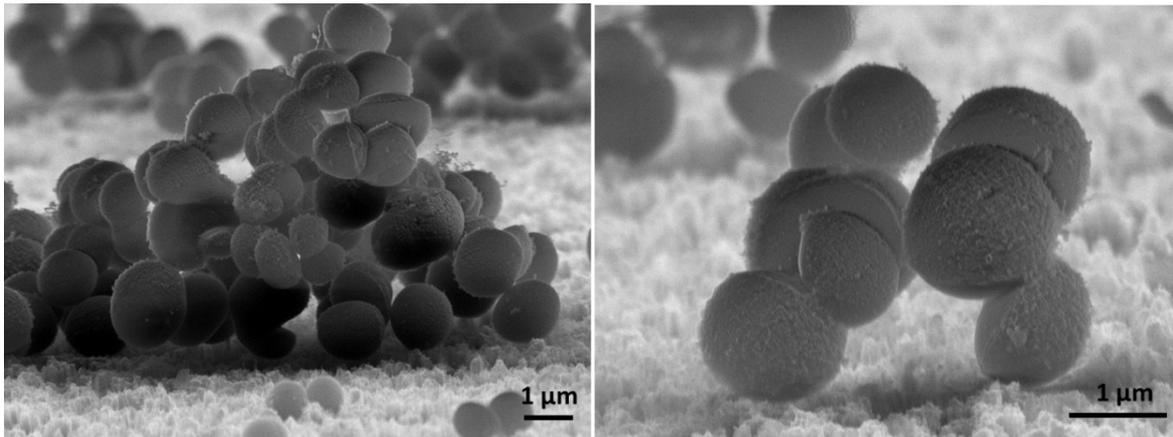


Figure S4. Representative SEM image of *S. aureus* on SiNWs after 8h of culture. *S. aureus* reveals vertical development of the colonies.

2.3. *S. aureus* colonization on flat silicon surfaces

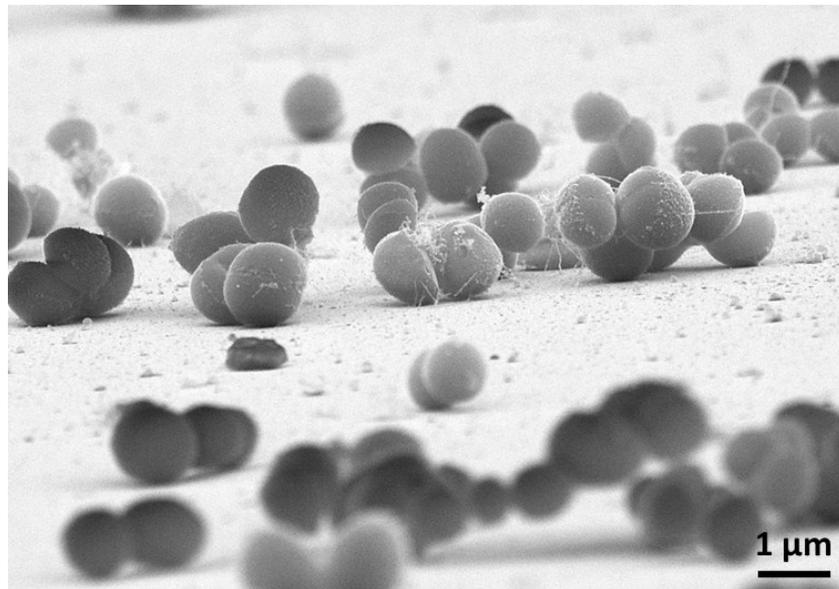


Figure S5. Representative SEM images of *S. aureus* colonization of flat silicon surface after 8h culture.

3. UV-Vis calibration curve for chlorhexidine (CHD) digluconate

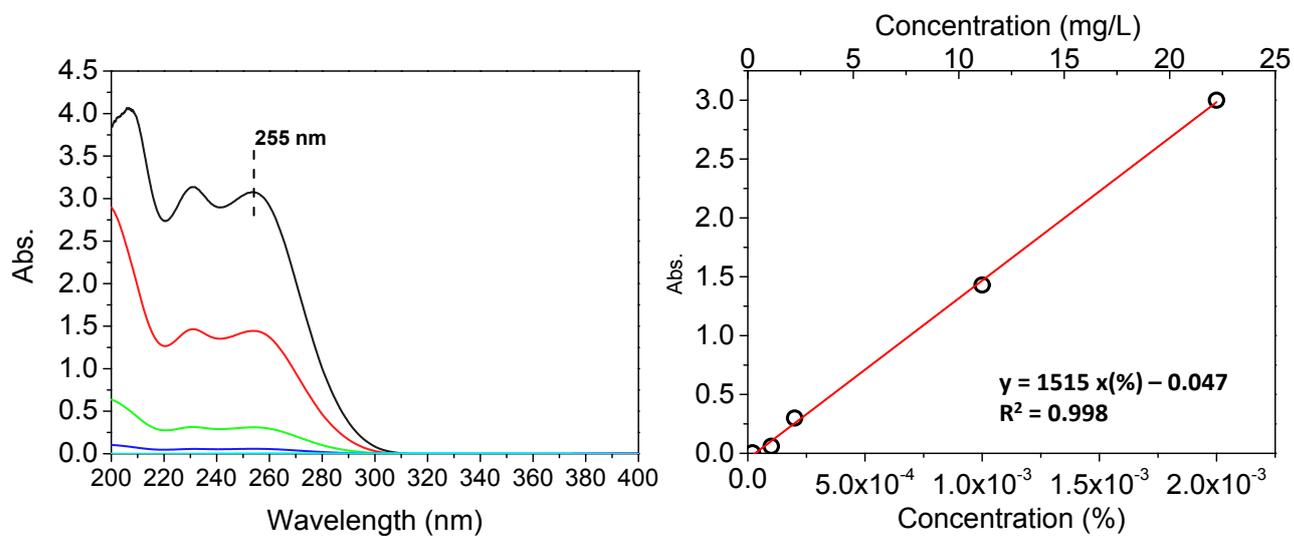


Figure S6. (a) UV-Vis spectra of different concentrations of CHD in water. (b) Calibration curve of CHD at $\lambda = 255$ nm.

4. SiNWs-APTES surfaces with low loading of chlorhexidine (CHD) digluconate

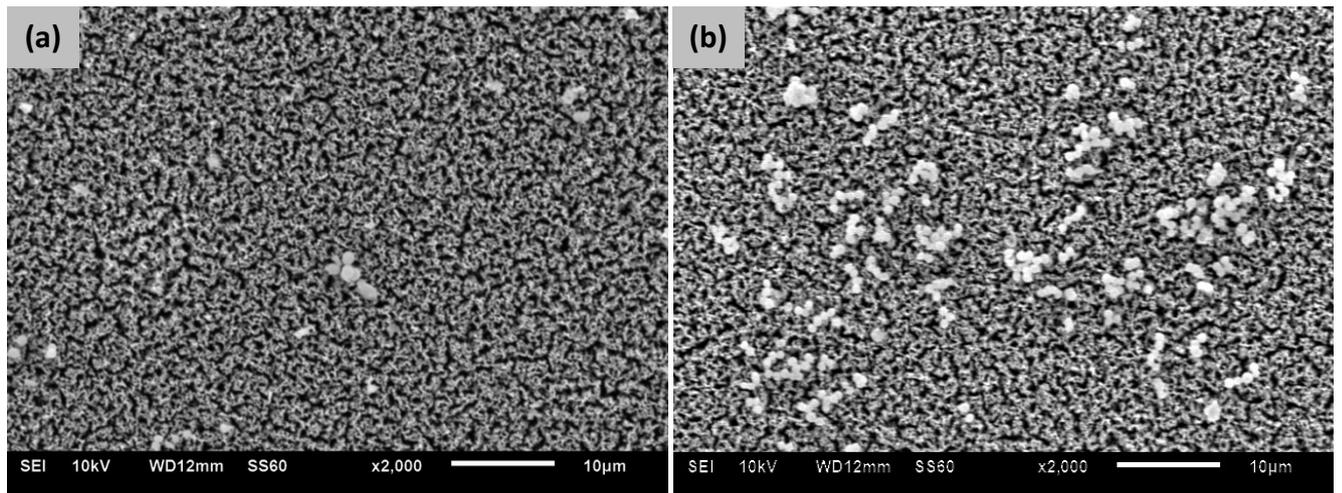


Figure S7. Representative SEM images of *S. aureus* on SiNWs functionalised with APTES and chlorhexidine (CHD) digluconate with loading concentration of 0.002% after different culture times: (a) 8 h (b) 24 h

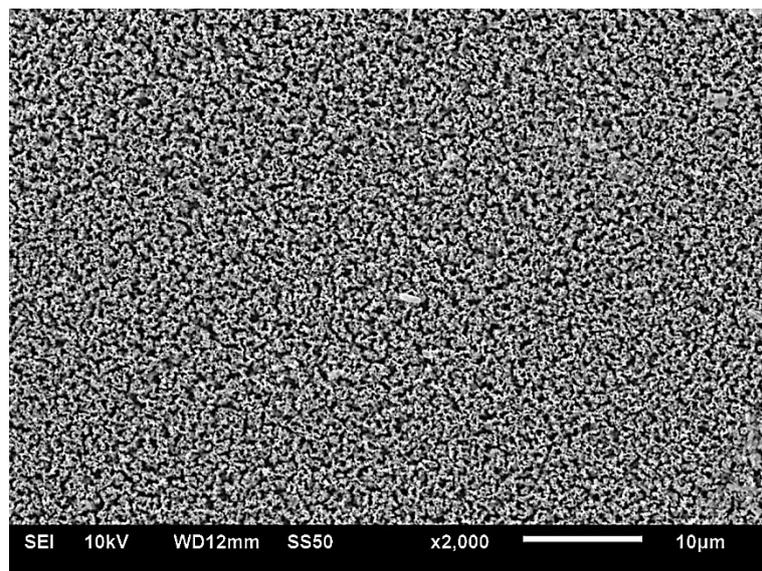


Figure S8. Representative SEM image of *E. coli* on SiNWs functionalised with APTES and chlorhexidine (CHD) digluconate with loading concentration 0.02% at 24 h, showing no recolonization.

5. Bacteria viability tests at surfaces (live/dead assays)

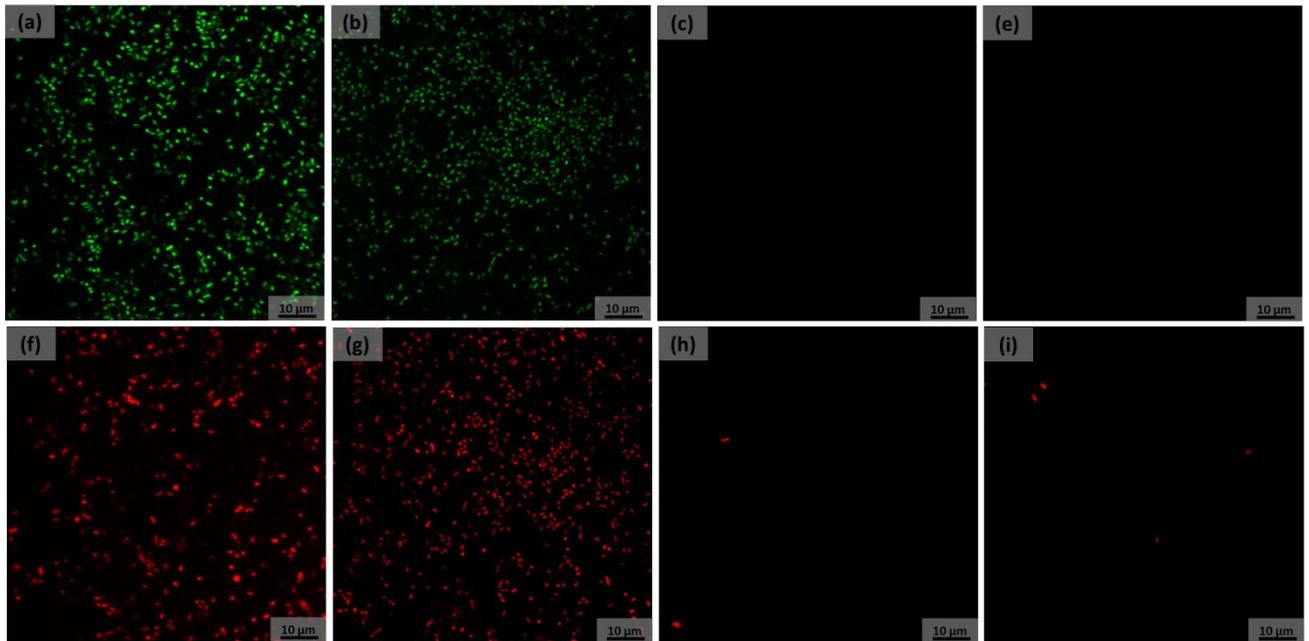


Figure S9. Representative confocal microscopy images of live (green) and dead (red) *E. coli* after 8h of culture on different surfaces: (a, f) SiNWs, (b, g) SiNWs-APTES, (c, h) SiNWs-APTES loaded with 0.02% CHD and (e, i) SiNWs-APTES loaded with 0.002% CHD

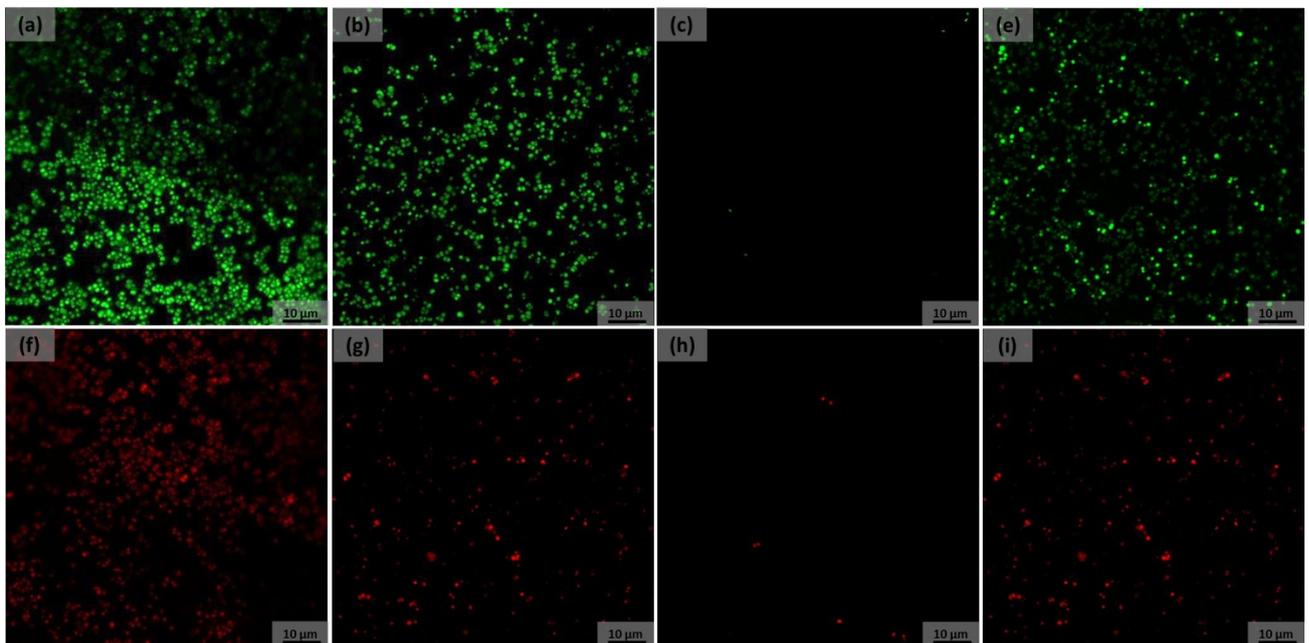


Figure S10. Representative confocal microscopy images of live (green) and dead (red) *S. aureus* after 8h of culture on different surfaces: (a, f) SiNWs, (b, g) SiNWs-APTES, (c, h) SiNWs-APTES loaded with 0.02% CHD and (e, i) SiNWs-APTES loaded with 0.002% CHD