Supporting Information

Self-Cleaning Antimicrobial Surfaces by SnO_2 Coatings on Glass Deposited with Surface-Bound Spermine

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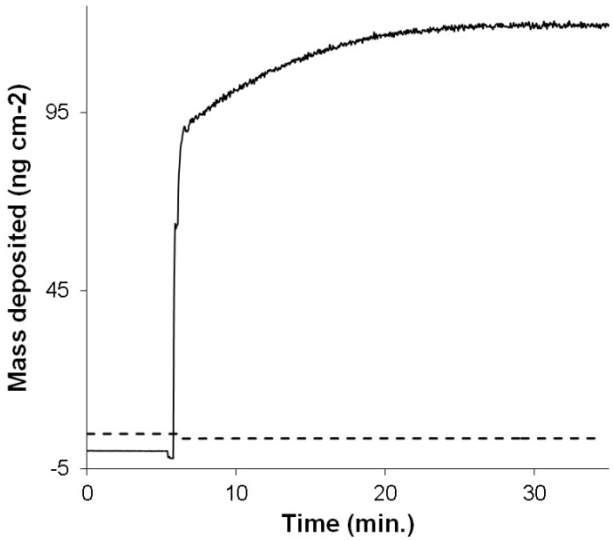

Figure S1. QCM measurement of SnO_2 deposition on spermine functionalized silica-based sensors (*black line*) and on non-functionalized sensors (*dotted line*). Injection of water stable tin oxide precursor was made after 5 min as indicated by the sudden change in the mass (frequency) and dissipation values in the spermine functionalized glass-based sensors whereas no changes are observed on non-functionalized glass surfaces.

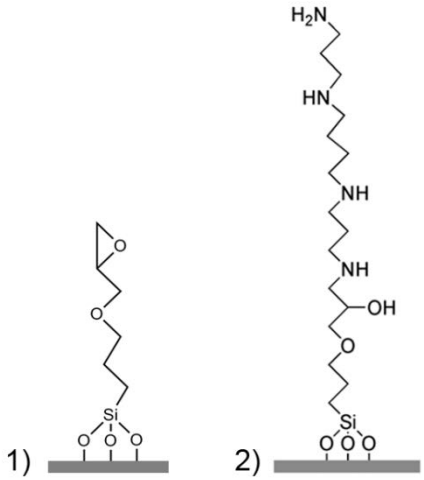

Figure S2. Functionalization of glass surfaces with spermine. Steps of functionalization in A: 1) Silanization of glass surface with epoxy terminated silane and 2) addition of spermine.

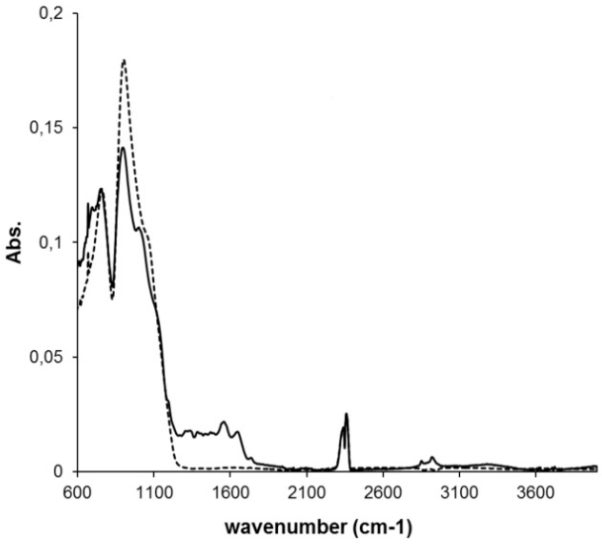

Figure S3. FTIR-ATR analysis of polyamine (spermine) functionalized glass surfaces (*solid line*) and non-functionalized glass surfaces (*dashed line*). The bands after functionalization indicate the immobilization of spermine.

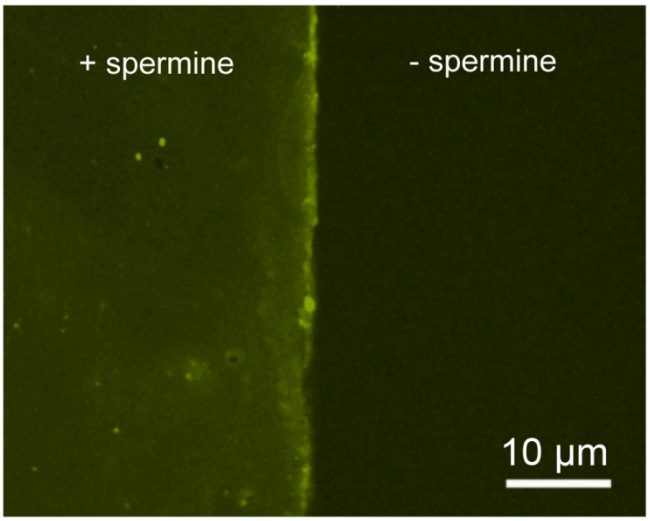

Figure S4. Detection of free amines on a spermine-functionalized surface using FITC (fluorescein isothiocyanate). Half of the surface (right side) was covered with Tesa tape before functionalization with spermine. The left side was incubated with spermine. On the left side, the presence of a green fluorescence signal indicates the presence of free amine groups (from spermine). Scale bar: 10 µm.

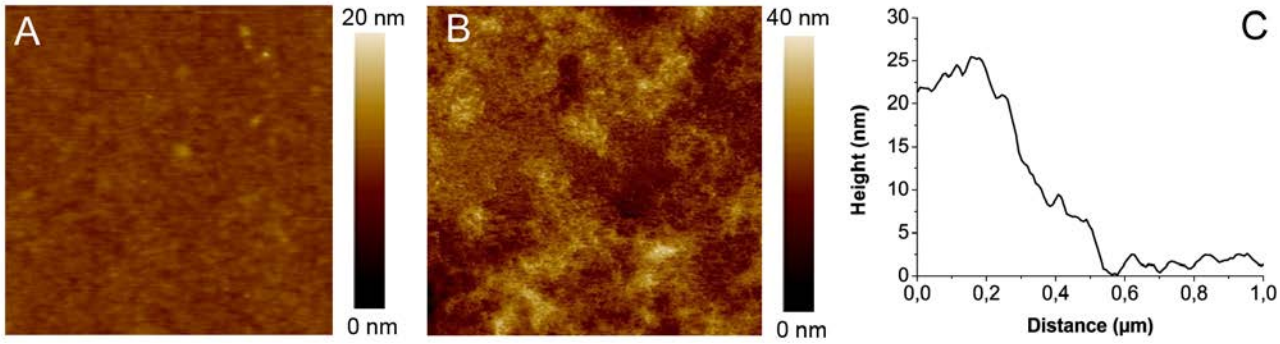

Figure S5. AFM height analysis of (A) bare glass slides showing a relatively smooth surface and (B) spermine functionalized glass slides where the increase in roughness points to successful deposition of spermine and (C) height profile graph of scratched spermine/SnO_2 coated glass slides.

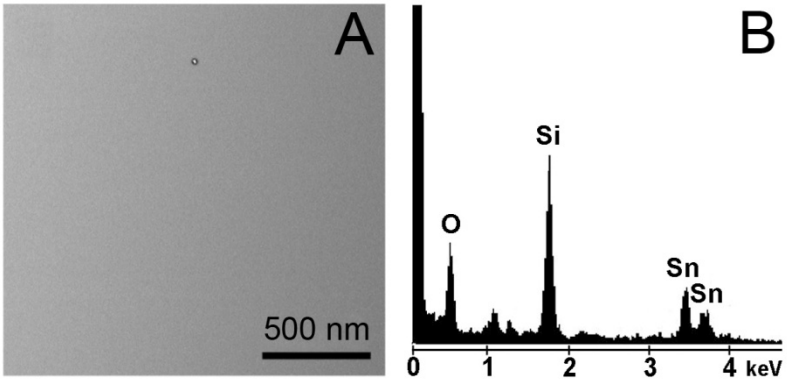

Figure S6. (A) SEM micrograph of a unfunctionalized glass slide showing a relative smooth surface. (B) EDX analysis on the spermine/SnO_2 coated surfaces where the presence of Sn can be detected. Si is due to the glass surface.

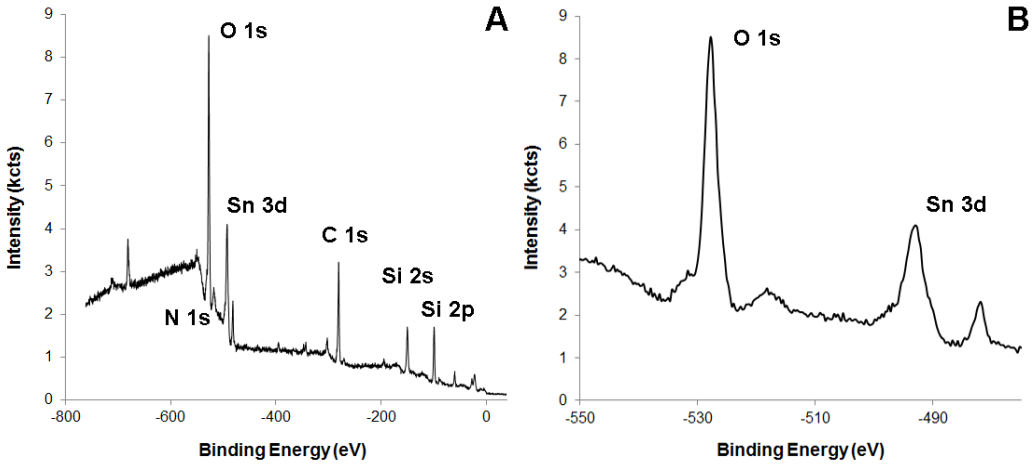

Figure S7. XPS analysis of a SnO_2 covered glass surface obtained with surface-bound mediated by polyamine. (A) Full range spectrum. (B) "Zoom in" of the area corresponding to the Sn 3d and O 1s binding energies.

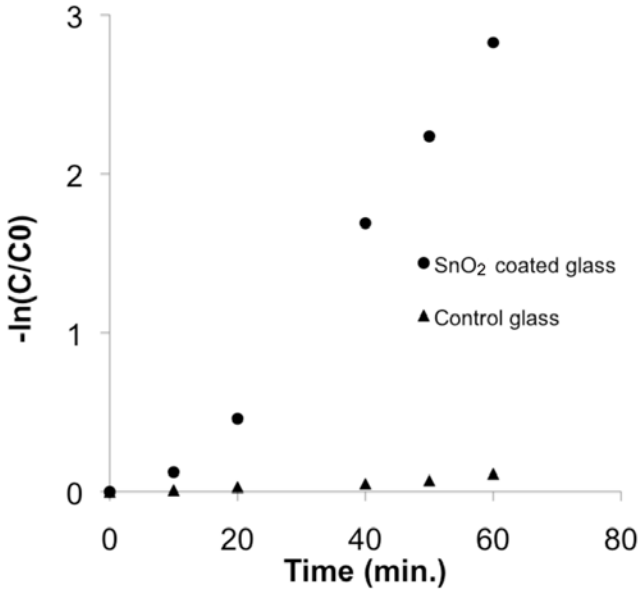

Figure S8. Kinetic profile in terms of ln(C/C0) of the degradation of rhodamine B by spermine/SnO_2 coated glass slides (black circles). As a control, bare glass slides where used, where no photodegradation occurred (black triangles). The rate constant obtained for the SnO_2 coated surfaces is 0.02 min^{-1}.

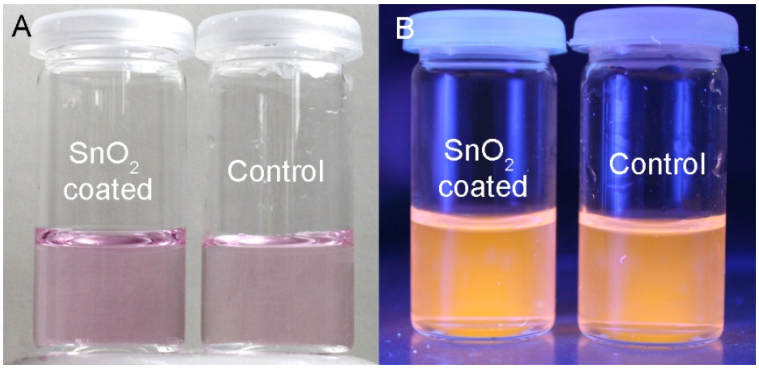

Figure S9. Control experiment for the photodegradation of rhodamine B with SnO_2 coated glass surfaces. Both non-functionalized surfaces (left vial) and SnO_2 coated surfaces (*right vial*) were kept under dark conditions. The digital images show that no photodegradation of the dye occurs, neither for solutions under (A) normal light nor (B) under UV light (λ_{ex}=254nm).

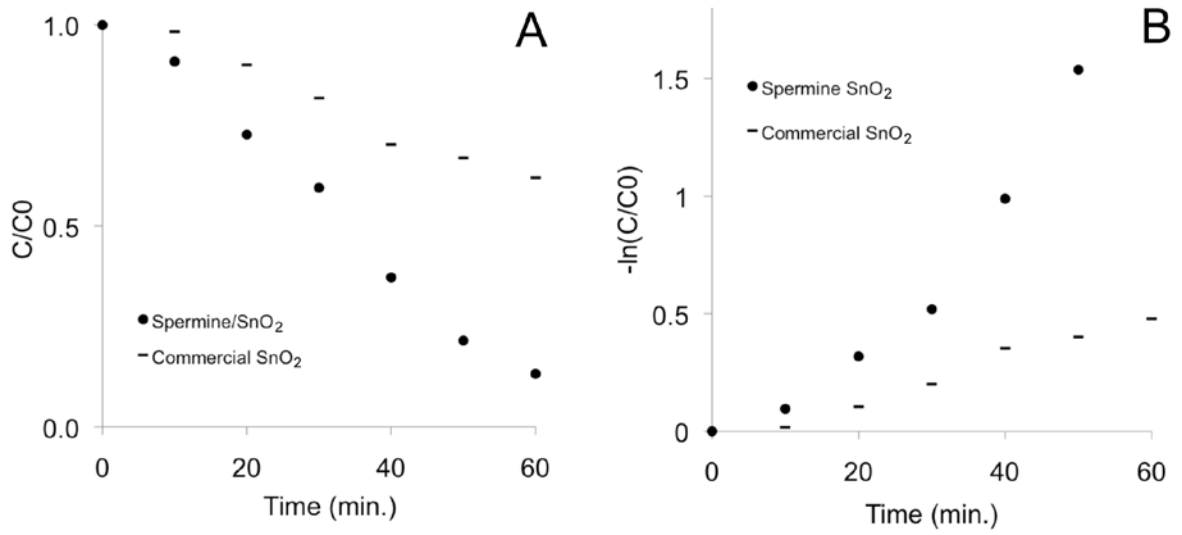

Figure S10. Control experiment for the photodegradation of rhodamine B (1µg/mL) with spermine-mediated SnO_2 particles (1 mg/mL) and with commercial SnO_2 nanoparticles. (A) Normalized concentration change of rhodamine B with changing irradiation time and (B) Kinetic profile of the photocatalytic degradation of rhodamine B. The rate constants obtained were 0.01 min^{-1} for the spermine/SnO_2 and 0.005 min^{-1} for the commercial SnO_2.

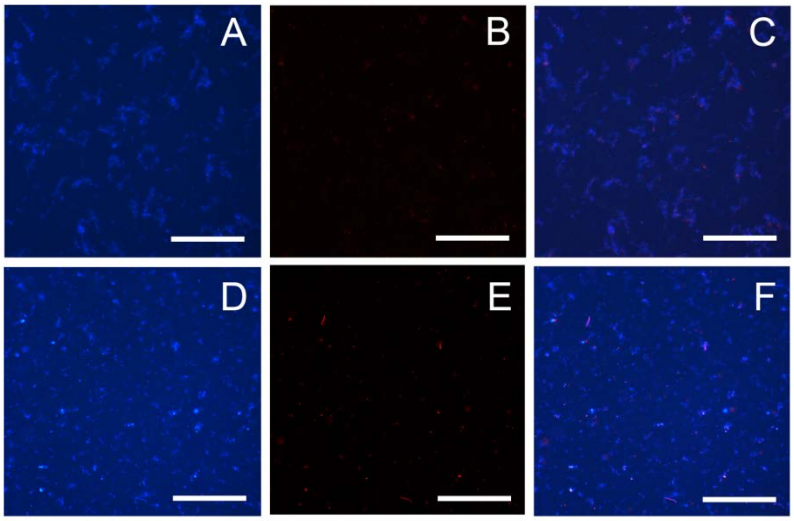

Figure S11. Incubation of non-functionalized glass surfaces with *E. coli*. (A) Under dark conditions for 2 h at 37ºC and (D) after exposed to light for 30 min. A and D correspond to the staining with DAPI and B and E to the staining with PI. C and F are overlays of A/B and D/E respectively. No positive staining with PI was observed indicating that the bacterial cells remain viable on non-functionalized glass surfaces.

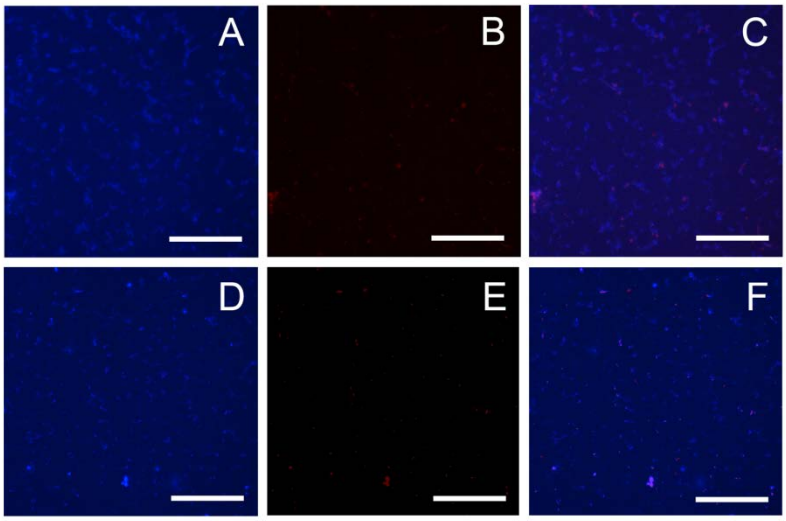

Figure S12. Incubation of SnO_2 coated of glass surfaces with *E. coli* (A) under dark conditions for 2h (A) and for (D) 4h. A and D correspond to the staining with DAPI and B and E to the staining with PI. C and F are overlays of A/B and D/E respectively. No positive staining with PI was observed indicating that the bacterial cells remain viable and this surface is not toxic *per se*.