

Electronic Supplementary Information for Recyclable antibacterial material: silicon grafted with 3,6-O-sulfated chitosan and specifically bound by lysozyme

Min Tan, Hongwei Wang*, Yanyun Wang, Gaojian Chen, Lin Yuan*, Hong Chen

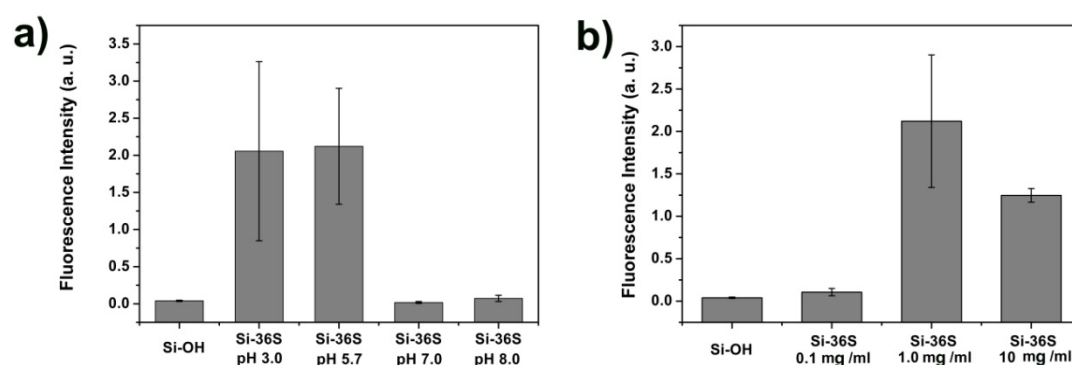


Fig. S1 The effect of solution pH (a) and sulfated chitosan concentrations (b) on grafting of 3,6-O-sulfated chitosan (3,6S-chitosan) on silicon wafer. Rhodamine 6G (R6G) was used as a fluorescent dye to characterize the distribution of negative charge (SO_3^-) on the modified surface. Prior to taking measurements, the surfaces were incubated in phosphate buffer (PB, pH=8.0) for 0.5 h and then immersed in PB with R6G 1.0 mg/ml for 0.5 h in the dark. After rinsing with PB 3 times for 10 min each, the fluorescence intensity was measured at 551nm ($\lambda_{\text{ex}}=528\text{nm}$) using a microplate reader (Varioskan Flash, Thermo Scientific, USA). The results suggest that the optimal reaction conditions are at pH 5.7 and using 1.0 mg/ml 3,6S-chitosan.

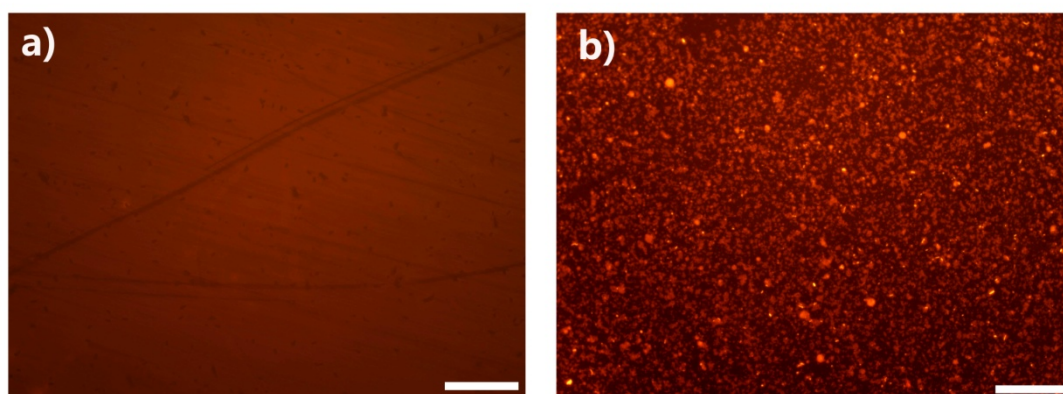


Fig. S2 Fluorescent image of “Piranha” solution treated silicon wafer (a) and 3,6S-chitosan grafted silicon wafer (b). After the wafers were stained by R6G, fluorescent pictures were taken with the fluorescence microscope (IX71, Olympus, Japan). Scale bar is 100 μm . The results showed that after “Piranha” solution treatment, silicon is oxidized and the surface will be introduced a few negative charged groups, while 3,6S-chitosan carries a lot of sulfated groups, which will significantly increase the fluorescence intensity.

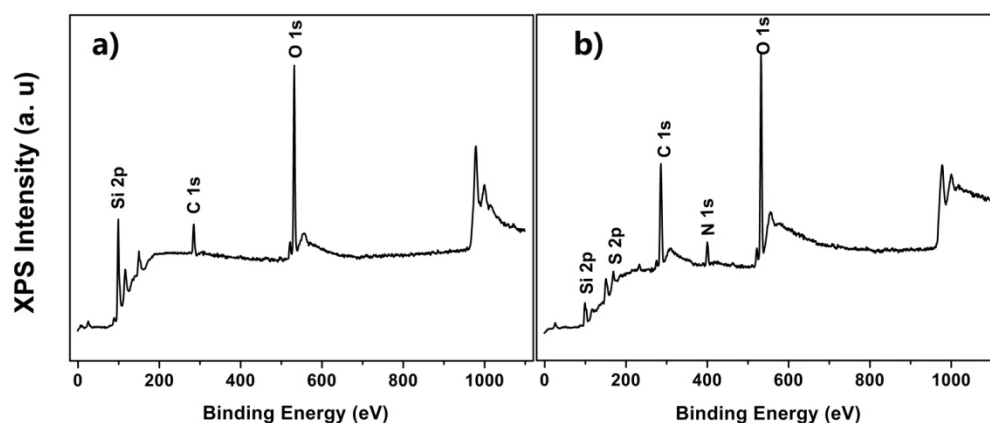


Fig. S3 XPS spectrum of “Piranha” solution treated silicon wafer (a) and 3,6S-chitosan grafted silicon wafer (b). The chemical composition of the surfaces was determined by XPS (ESCALAB MK II X-ray photoelectron spectrometer, VG Scientific). Typical S2p and N1s peaks appear significantly on 3,6S-chitosan grafted silicon wafer. The results indicate that 3,6S-chitosan had been successfully grafted to the silicon surface.

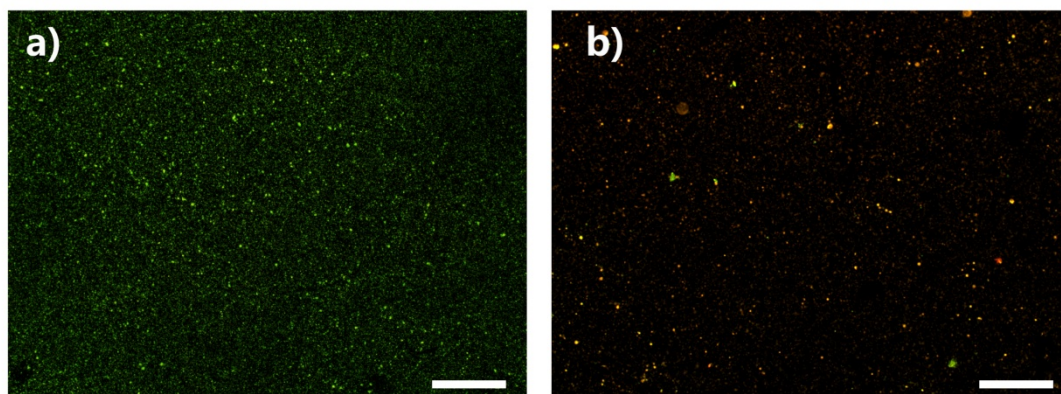


Fig. S4 Antibacterial effect of 3,6S-chitosan-grafted surfaces on *Staphylococcus aureus*. (a): unmodified silicon wafer; (b): lysozyme-loaded 3,6S-chitosan-grafted silicon wafer. The green and red fluorescent spots represent live and dead *S. aureus* cells, respectively. Scale bar is 100 μm .