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 ($\lambda_{ex}$=528nm) 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.