ESI

Antimicrobial surface grafted thermally responsive PNIPAM-co-ALA nano-gels

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TEM imaging of pp-MA and non-modified grids with nano-gels

The grids were prepared in the same way as described for the fabric. Figure 1a shows the nano-gels in an ordered arrangement were the gels have grafted to the maleic anhydride whereas figure 1b shows that when there is no pp-MAH the gels have not grafted to the surface but have clumped together instead to form aggregates. The same plasma conditions (1/40, 50 W for 30 minutes) were used for the TEM grids as well as the same synthesis methods. Two different tests were run; the first was a TEM grid that underwent plasma deposition of maleic anhydride then had the nanogels grafted to the surface. The second control sample was a TEM grid that had no plasma deposited maleic anhydride so therefore should not show any grafting of the nanogels

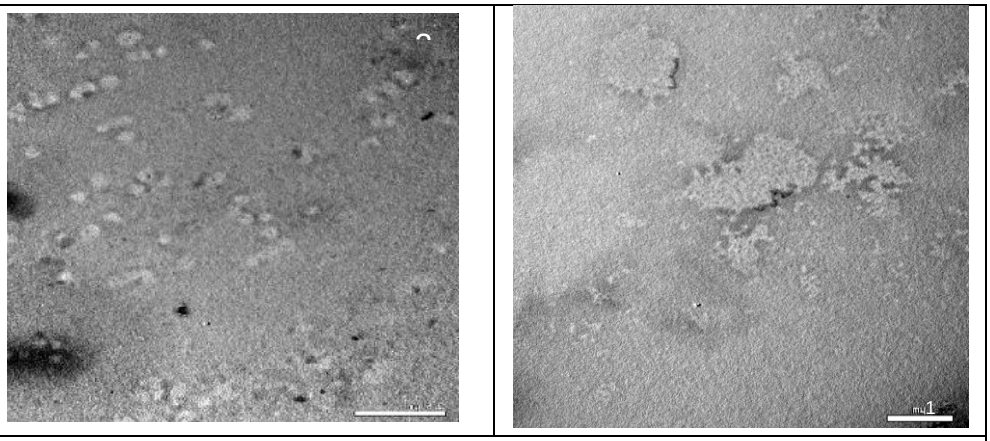

Figure 1a: on the left shows a TEM grid which was modified using plasma polymerised maleic anhydride and then nano-gels grafted to the surface (0.5µm). Figure 1b Without the pp-MAH the nano-gels have to sites to graft to on the non-woven polypropylene

FT-IR

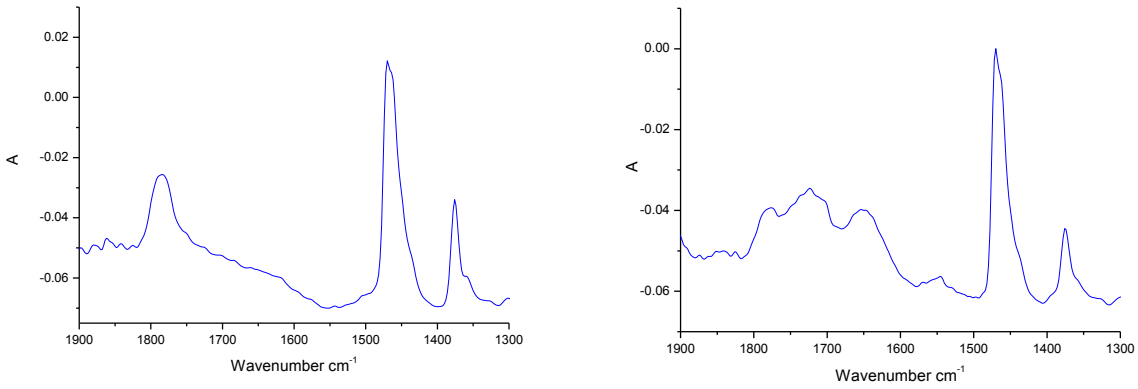

Figure 2: (a) FT-IR of pp-MAH, 2(b) FT-IR after PNIPAM-co-allyamine gels were grafted to the surface via amide formation

Estimation of graft density

The graft density on nano-gels on the fabric was estimated by simple weighing of the fabrics before and after nano-gel attachment. Measurements were made on three 3 x 3 cm square of

fabric: mass with pp-MA: 13.9 mg +/- 1.5 mg; mass following nano-gel grafting (dry): 18.9 mg +/- 1.6 mg, suggesting as substantial graft density in the non-woven fabric matrix, although it is possible that some water was retained in the polymer after drying.

Sample	**Mass / g**
Non-woven polypropylene (NWP)	0.0131g +/- 0.0021
NWP + pp-MAH	0.0139g +/- 0.0015
NWP + pp-MAH + nano gels	0.0189g +/- 0.0016
NWP + pp-MAH + nano gels + silver	0.0187g +/- 0.0023

Silver content assay

Atomic absorption spectroscopy (AAS)was used to measure the loading of the silver in the nanogels. The nanogels were dried by rotary evaporation and the weights measured. Three samples were loaded with silver as described above, and then separated from the silver solution via filter centrifugation and then washed in deionised water and re-centrifuged. A set weight of the loaded gels were added to 1ml of deionised water. Aliquots of the solution were taken at room temperature over 4 hours at which point the temperature was raised to 45°C to allow for gel collapse and the silver to be released. The measurements were taking in ppm and converted to mmol/g using the weight of the dry polymer.

Bacterial growth measured after 5 hours (histogram)

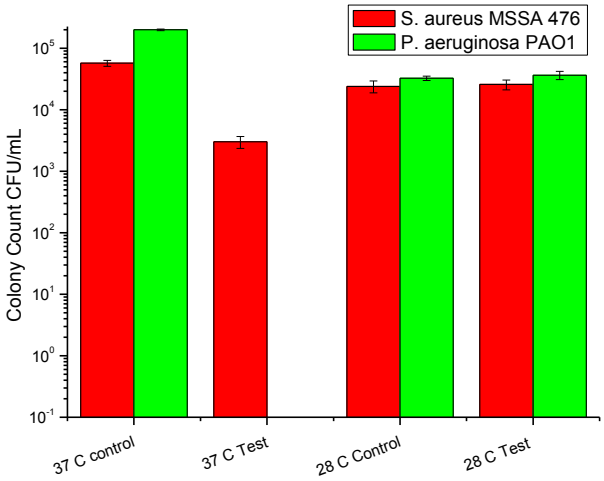

Figure 3. Growth of (a) *S. aureus* MSSA 476 and (b) *P. aeruginosa* PAO1 after 5 hours in the presence of silver nano-gels at 28°C and 37°C vs. controls.