Electronic Supplementary Information

Photochemically Assisted One-Pot Synthesis of PMMA Embedded Silver Nanoparticles: Antibacterial Efficacy and Water Treatment

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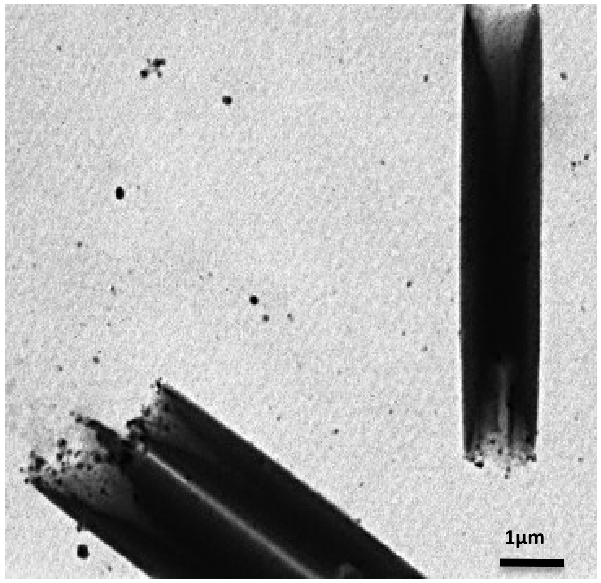
Figures

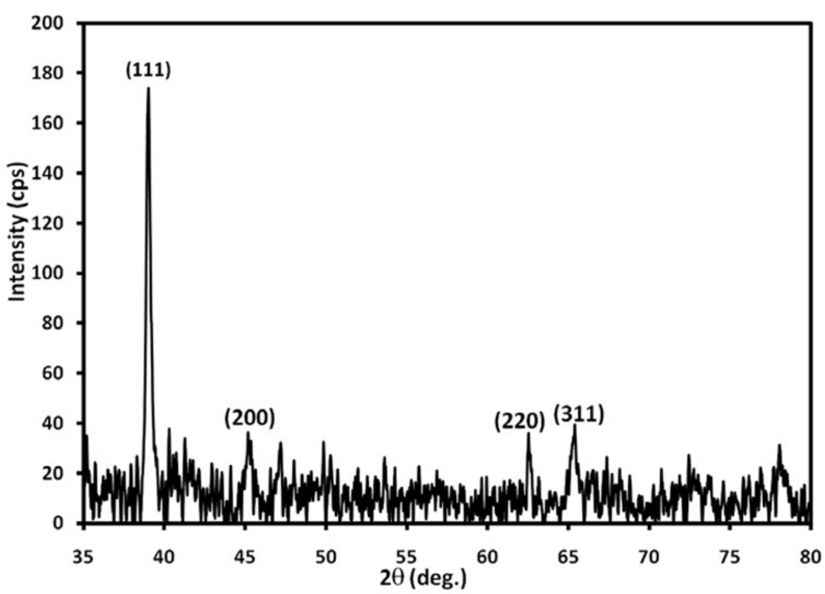
Table

1. TEM micrograph



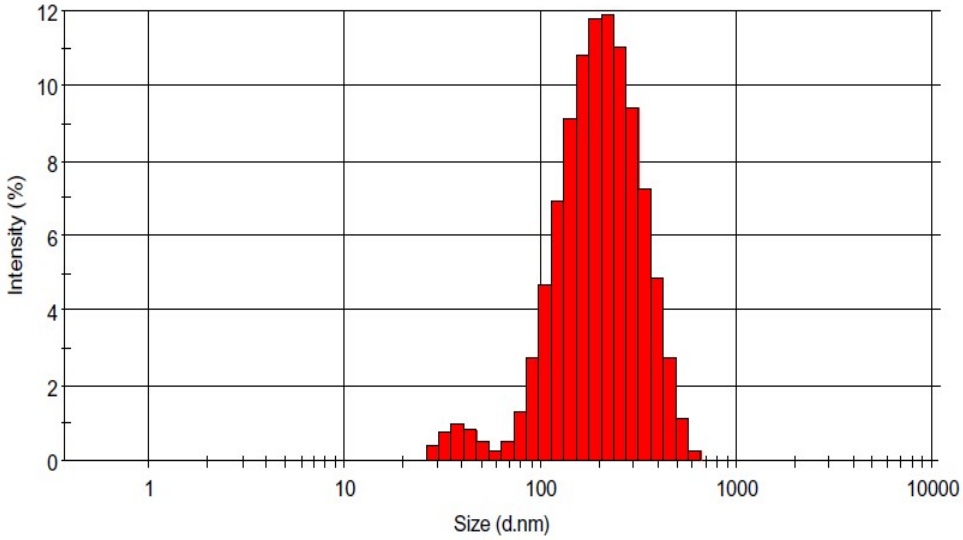
SI-Figure 1. TEM micrograph of polymer embedded AgNPs.

2. XRD



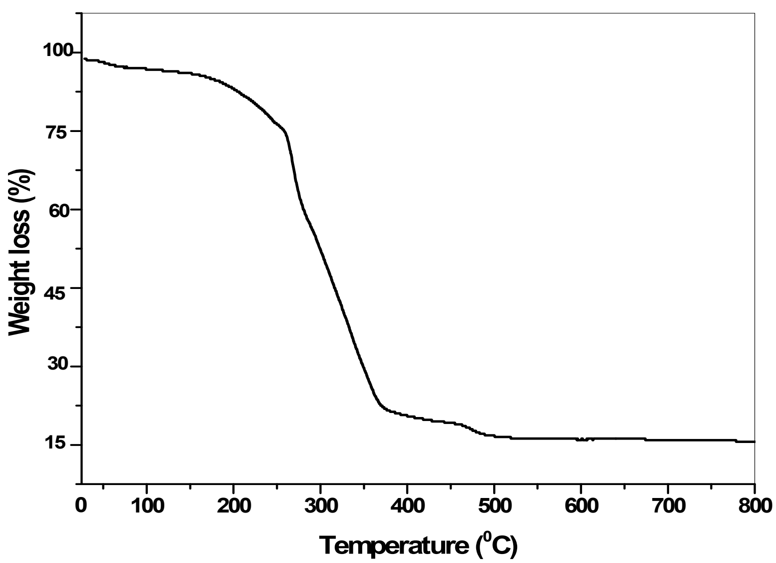
SI-Figure 2. X-Ray diffractogram of silver-poly (methyl methacrylate) nanocomposite.

3. DLS



SI-Figure 3. Size distribution of polymer embedded AgNPs measured by the DLS technique.

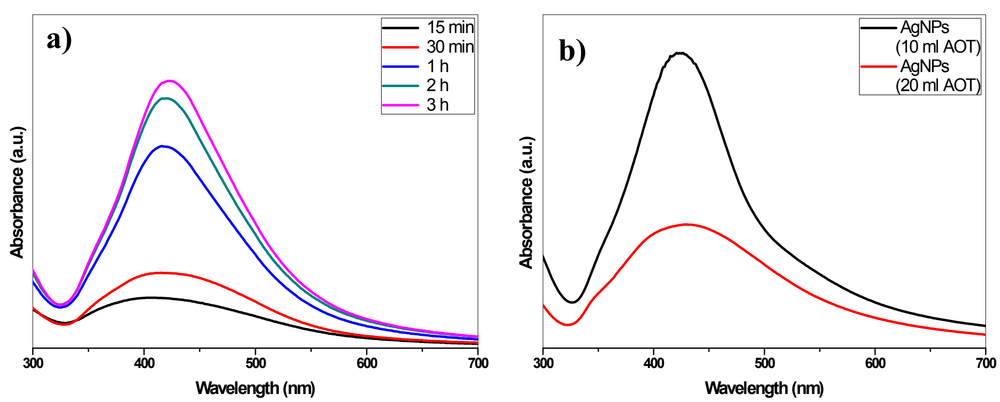
4. TGA



SI-Figure 4. TGA curve of polymer embedded AgNPs.

5. Role of AOT

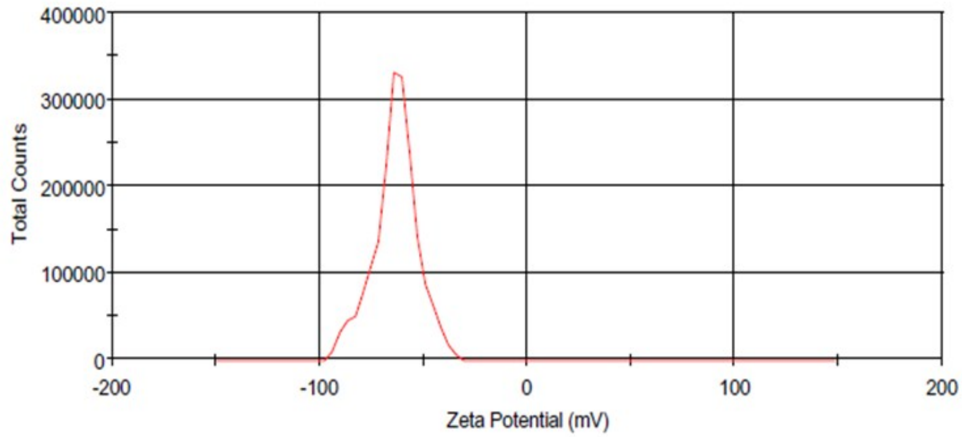
In order to verify the role of AOT in the synthesis, a blank system containing only silver ion and AOT (without MMA) was examined. The SPR band starts to appear after 15 minutes of irradiation and grows with time (Figure S5). Formation of Ag-PMMA nanocomposite was completed within 3 h, however further irradiation more than 3 h showed no change in SPR band (data not shown here). This study indicates that AOT acts as a stabilizing agent to prohibit aggregation of silver. AOT has hydrophobic twin tail groups and possesses sulfonate head group. It is already reported that AOT surfactant stabilized AgNPs by coordinating sulfonic group of AOT.[1] Also to check the effect of volume of AOT surfactant, a set of experiments was carried out. The volume of AOT was varied from 10 to 20 mL. Variation in volume of AOT had a direct impact on the absorption spectra. Figure S5 shows the optical spectra of AgNPs synthesized using 10 mL and 20 mL of AOT (without MMA monomer). The SPR band becomes broader and suppression of SPR intensity was observed. This study clearly indicates that 10 mL is optimum amount for the synthesis of AgNPs. In addition, to ensure the compatibility of solutions, it was checked that AOT and MMA are not interacting with AIBN before irradiation.



SI-Figure 5. UV-Visible spectra of (a) AOT stabilized AgNPs (without MMA monomer) and (b) AgNPs synthesized using different AOT volumes.

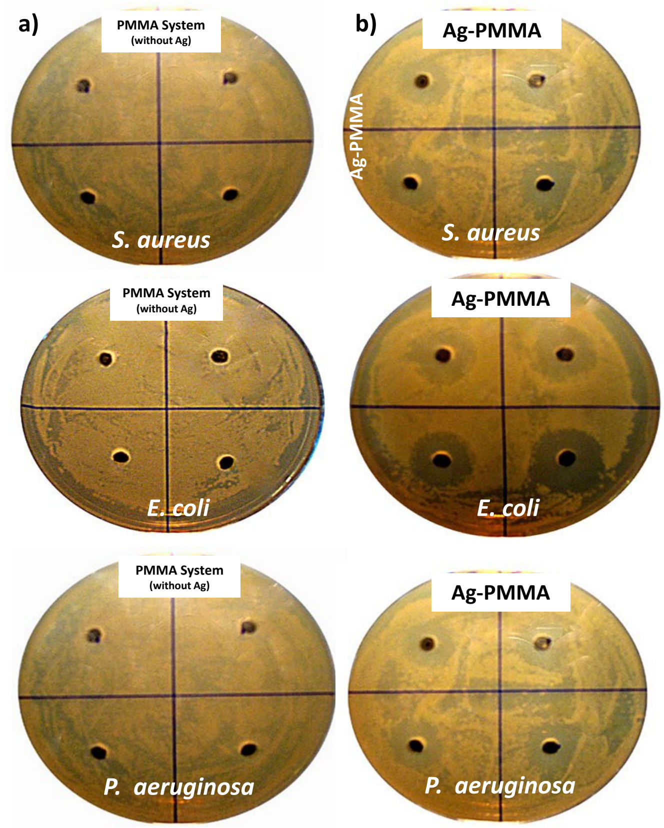
1. S. Mandal, S. K. Arumugam, R. Pasricha and M. Sastry, *Bull. Mater. Sci.,* 2005, **28**, 503–510.

6. Zeta potential



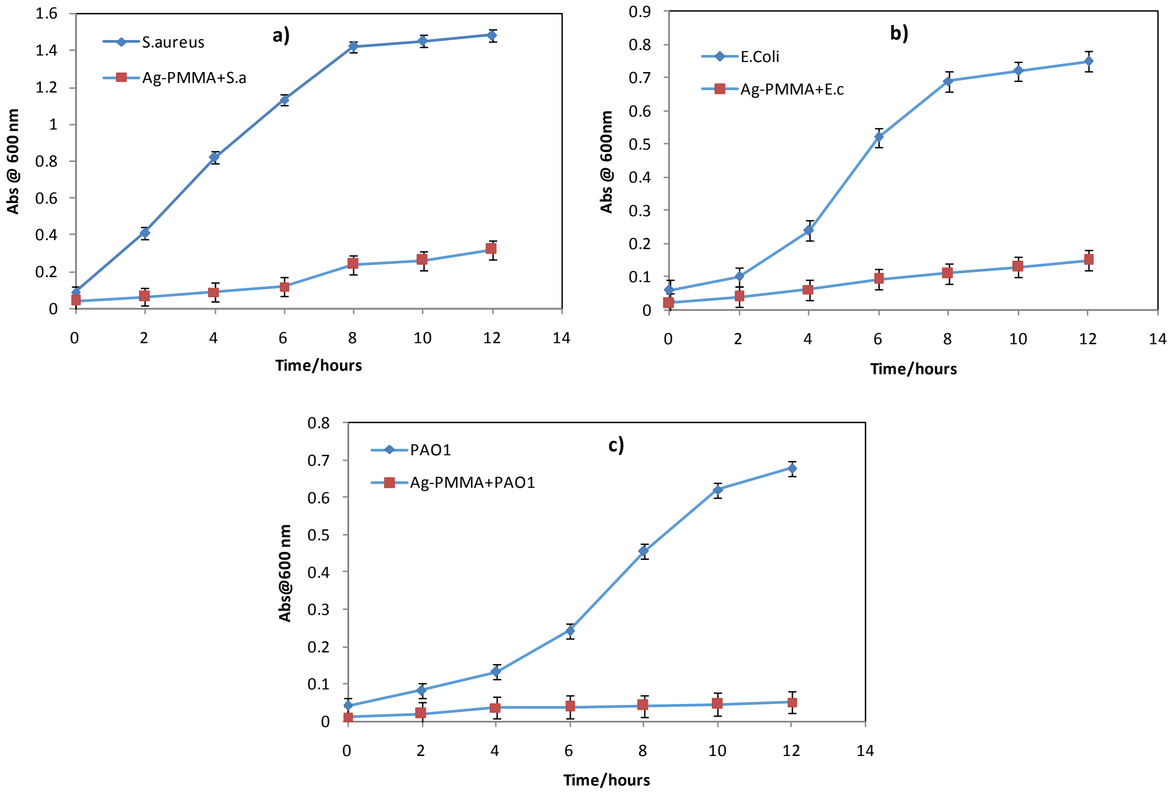
SI-Figure 6. Zeta potential of polymer embedded AgNPs.

7. Zone of Inhibition



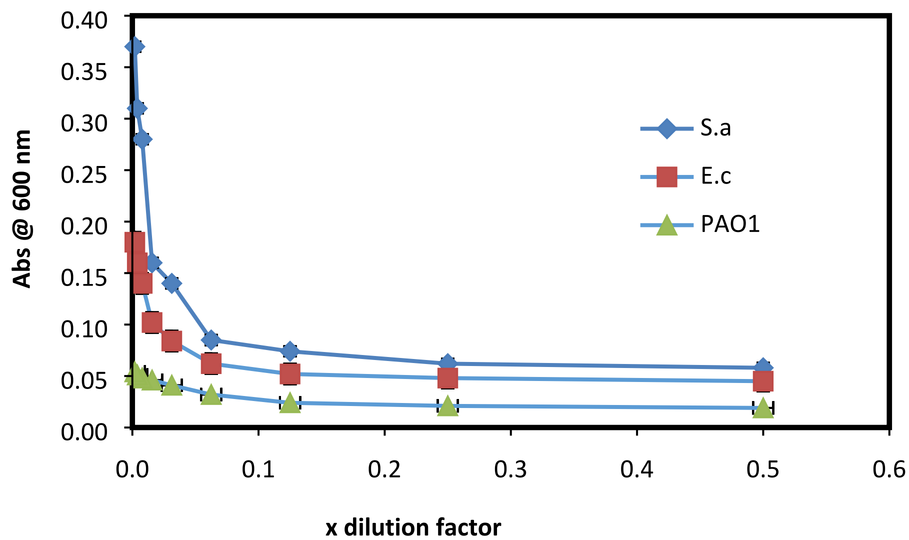
SI-Figure 7. Zone of inhibition of (a) PMMA system (without Ag) and (b) Ag-PMMA nanocomposite against *S. aureus, E. coli* and *P. aeruginosa* bacteria. Three independent experiments were held.

8. Bacterial growth curve



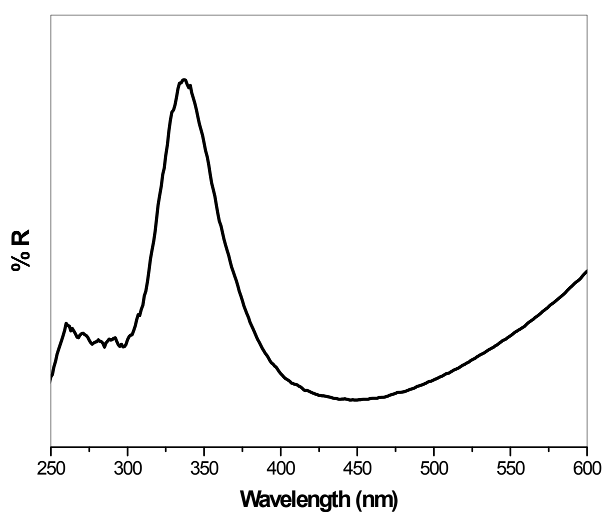
SI-Figure 8. Bacterial growth curve in LB media. Different concentrations of Ag-PMMA nanocomposite was added to the (a) *S. aureus* (b) *E. coli* and (c) *P. aeruginosa.* The growth of the bacteria was monitored measuring the optical density at 600 nm. Three independent experiments were held. ±SD are shown as the *error bar*.

9. MIC plot



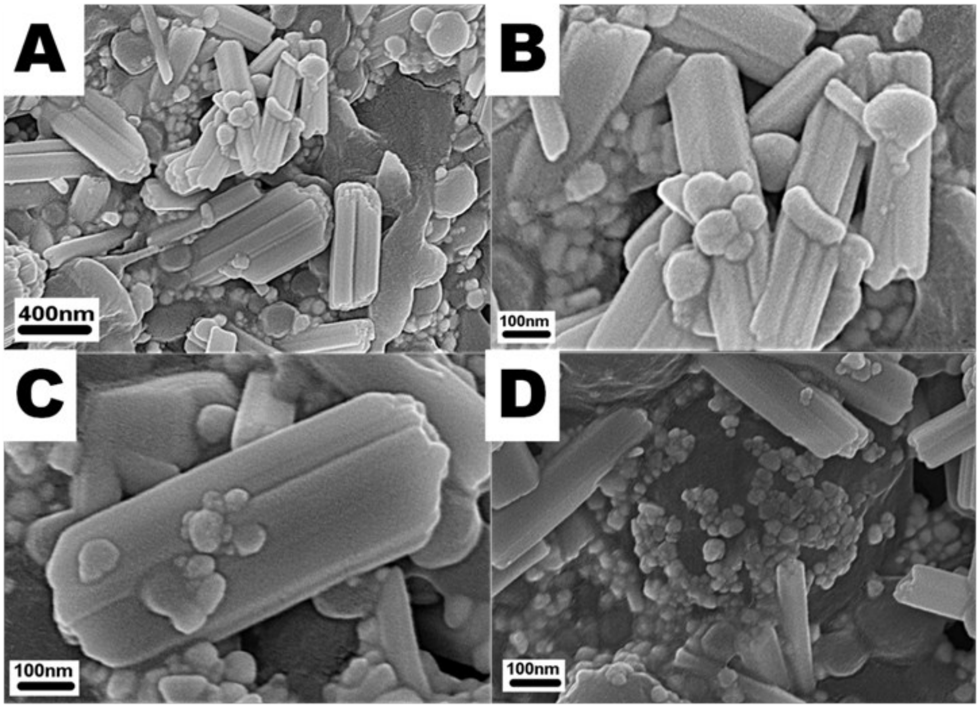
SI-Figure 9. Minimum inhibitory concentration plot of Ag-PMMA nanocomposite for *P. aeruginosa, E. coli* and *S. aureus* bacteria. Three independent experiments were held. ±SD are shown as the *error bar*.

10. DRS



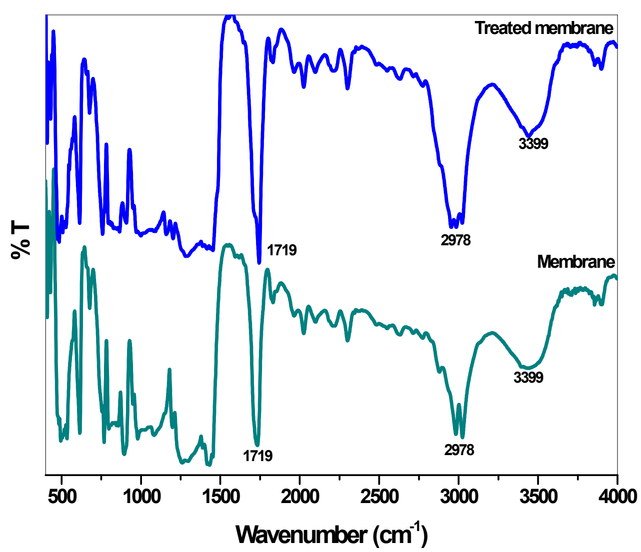
SI-Figure 10. Diffuse reflectance spectroscopy (DRS) spectrum of treated membrane.

11. FE-SEM -Treated membrane



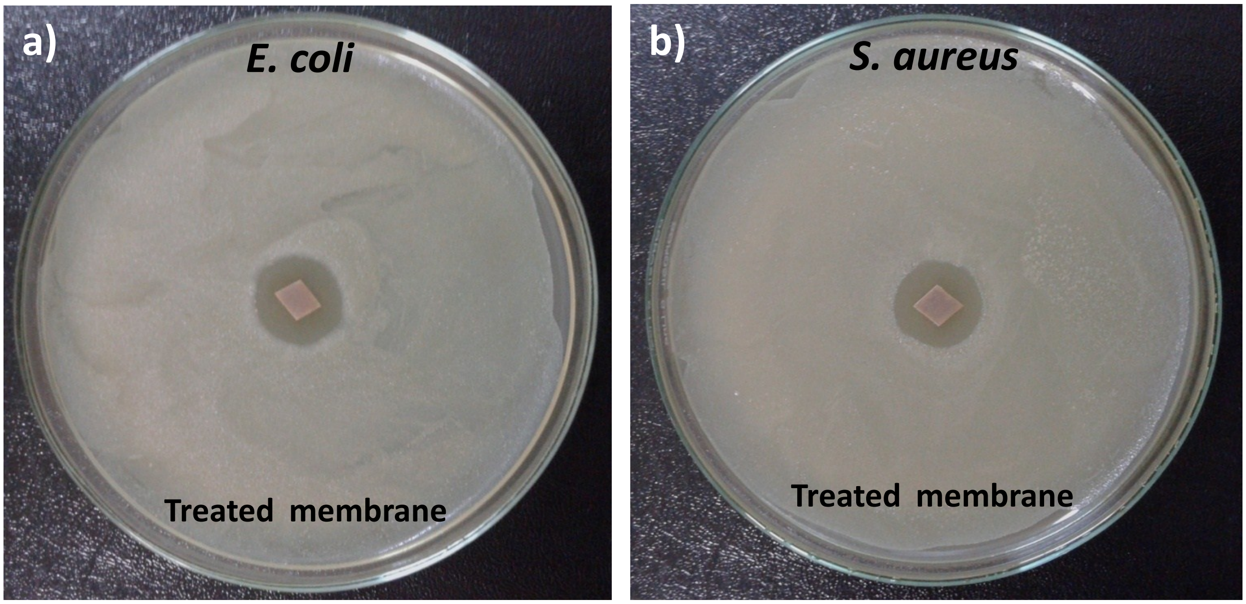
SI-Figure 11. FE-SEM images (A-C) showing rod like structures PMMA with embedded Ag-nanoparticles, and (D) Ag-PMMA nanocomposite are adsorbed onto the membrane.

12. FTIR



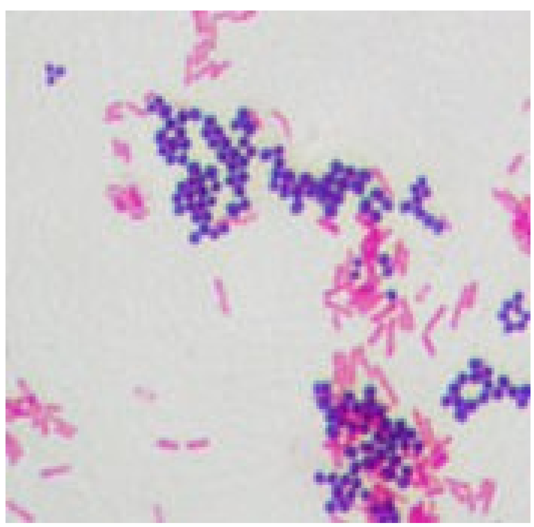
SI-Figure 12. FTIR spectra of untreated membrane (green line) and treated membrane (blue line).

13. Zone of inhibition-Treated membrane



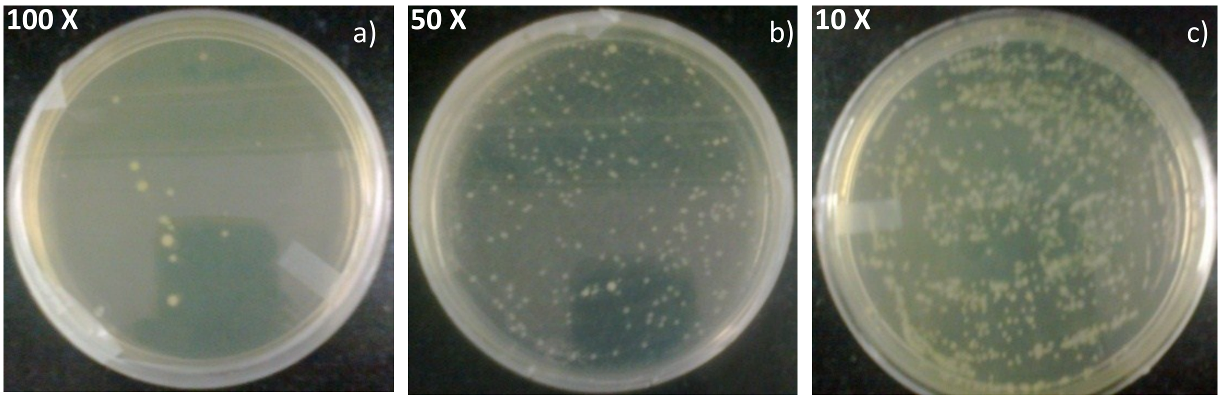
SI-Figure 13. Zone of inhibition of treated membrane against (a) *E. coli* and (b) *S. aureus*.

14. Microscopy image



SI-Figure 14. Microscopy image Gram positive and Gram negative bacteria present in sludge water.

15. Bacterial growth -Untreated membrane



SI-Figure 15. Bacterial growth (a to c) of sludge water passed through blank membrane at different dilution.

Table 1

SI-Table 1. MP-AES analysis to quantify amount of silver content in effluent of diluted sludge water (10 X to 100 X) of treated membrane.

Sample (diluted sludge water)	Silver content (ppm)
10 X	0.09
50 X	0.05
100 X	0.05