

# **Aniline tetramer embedded polyurethane/siloxane membranes and their corresponding nanosilver composites as intelligent wound dressing materials**

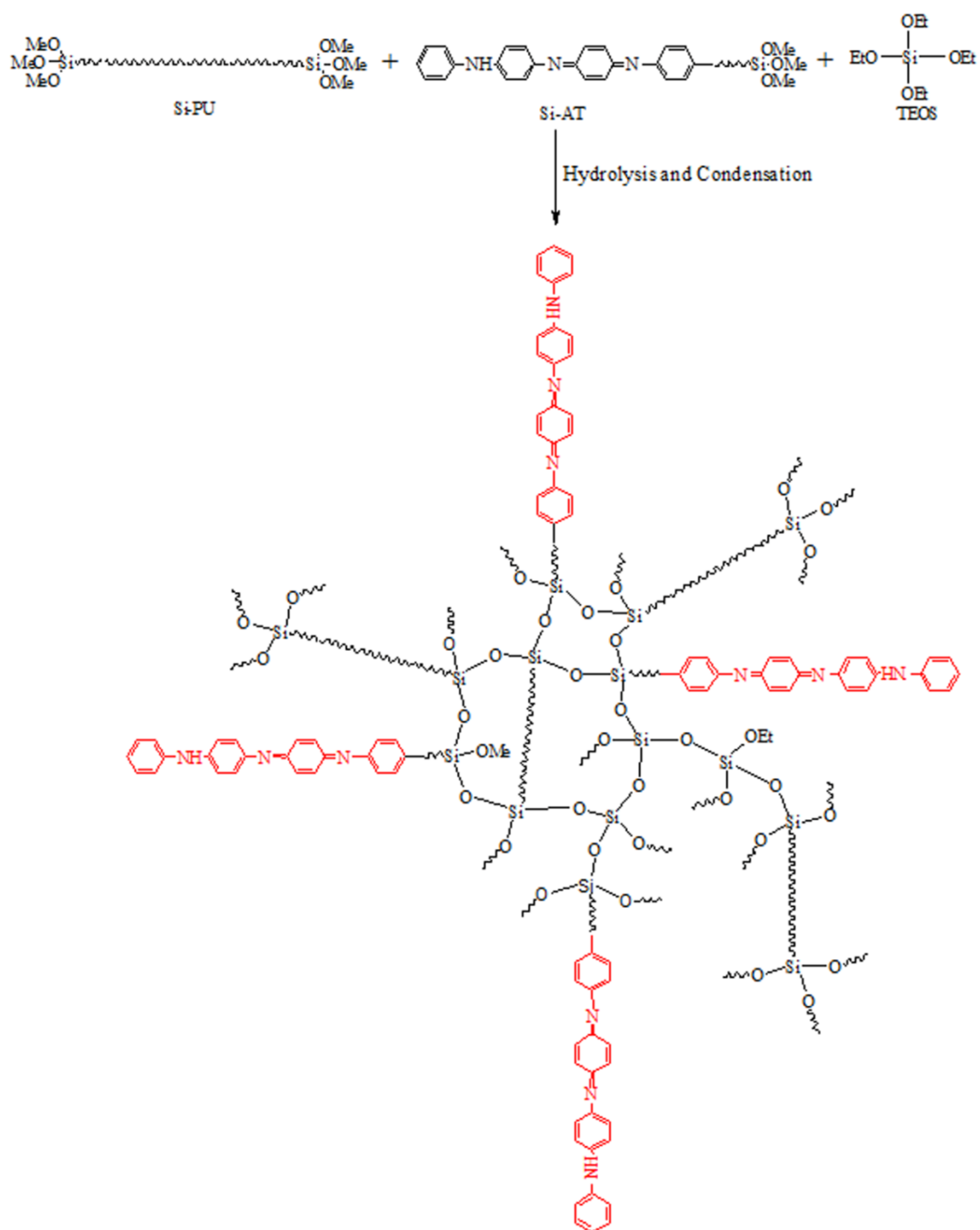
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**Supplementary information**

## S1. Schemes, Figures and Table



Scheme S1: Synthetic route to polyurethane/siloxane networks

FTIR spectrum of Si-PU (Figure S1) showed a broad band centred at  $3335\text{ cm}^{-1}$ , which was attributed to the stretching vibration of urethane and urea N-H groups. The urethane carbonyl (NH-CO-O-) group was detected as a strong peak at  $1716\text{ cm}^{-1}$ . The peak observed at  $1545\text{ cm}^{-1}$  was attributed to C-N stretching, combined with N-H out-of-the-plane bending of urethane groups, and the stretching vibration of ether (C-O-C) groups was noticed as a peak at  $1100\text{ cm}^{-1}$ . The presence of methoxysilane (-Si-O-CH<sub>3</sub>) and urea carbonyl (-NH-CO-NH-) peaks at their corresponding absorptions of  $950\text{ cm}^{-1}$  and  $1675\text{ cm}^{-1}$ , and the absence of NCO groups peak at  $2230\text{ cm}^{-1}$  indicated the complete reaction of isocyanate and NH<sub>2</sub> groups.

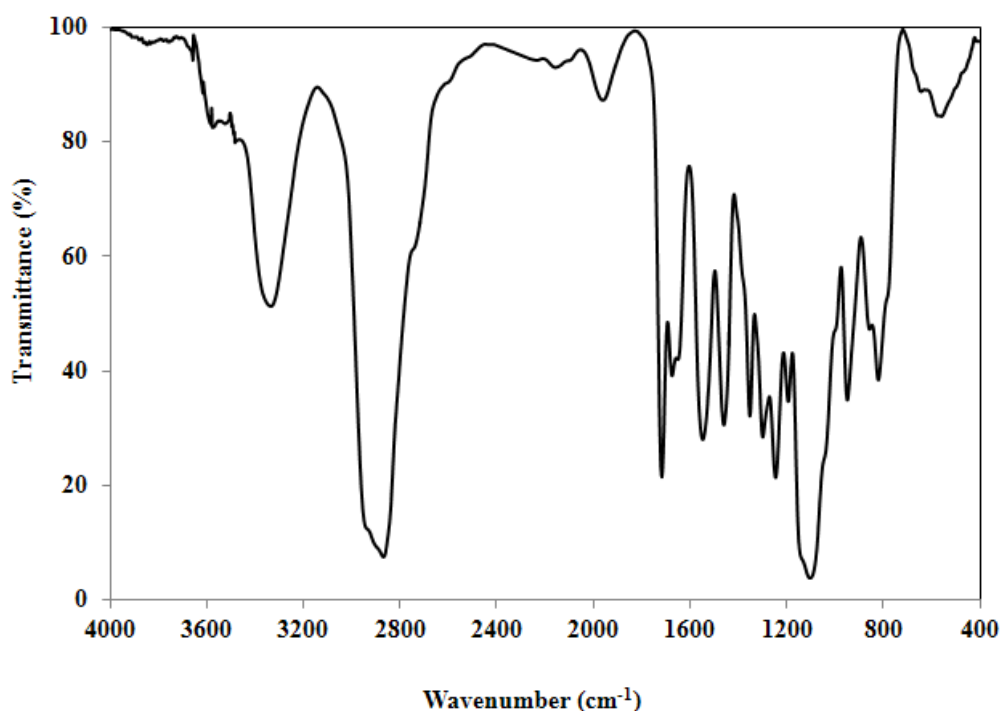


Figure S1: FTIR spectrum of Si-PU

FTIR spectrum of AT (Figure S2a) showed peaks at  $3340$  and  $3185\text{ cm}^{-1}$  associated to amine groups. Stretching vibrations of quinoid and benzenoid rings were also appeared as peaks at  $1591$  and  $1495\text{ cm}^{-1}$ , respectively. After reaction with coupling agent (Figure S2b) the peaks related to terminal amine were diminished considerably and two new peaks at  $1653$  and  $1701\text{ cm}^{-1}$  were appeared, which related to the formation of the imine (-N=CH-) and aldehyde (-CHO) groups, respectively. After reaction of GA-AT with APS, the peak of free aldehyde groups disappeared, but the peak of imine moiety at  $1659\text{ cm}^{-1}$  was intensified (Figure S2c).

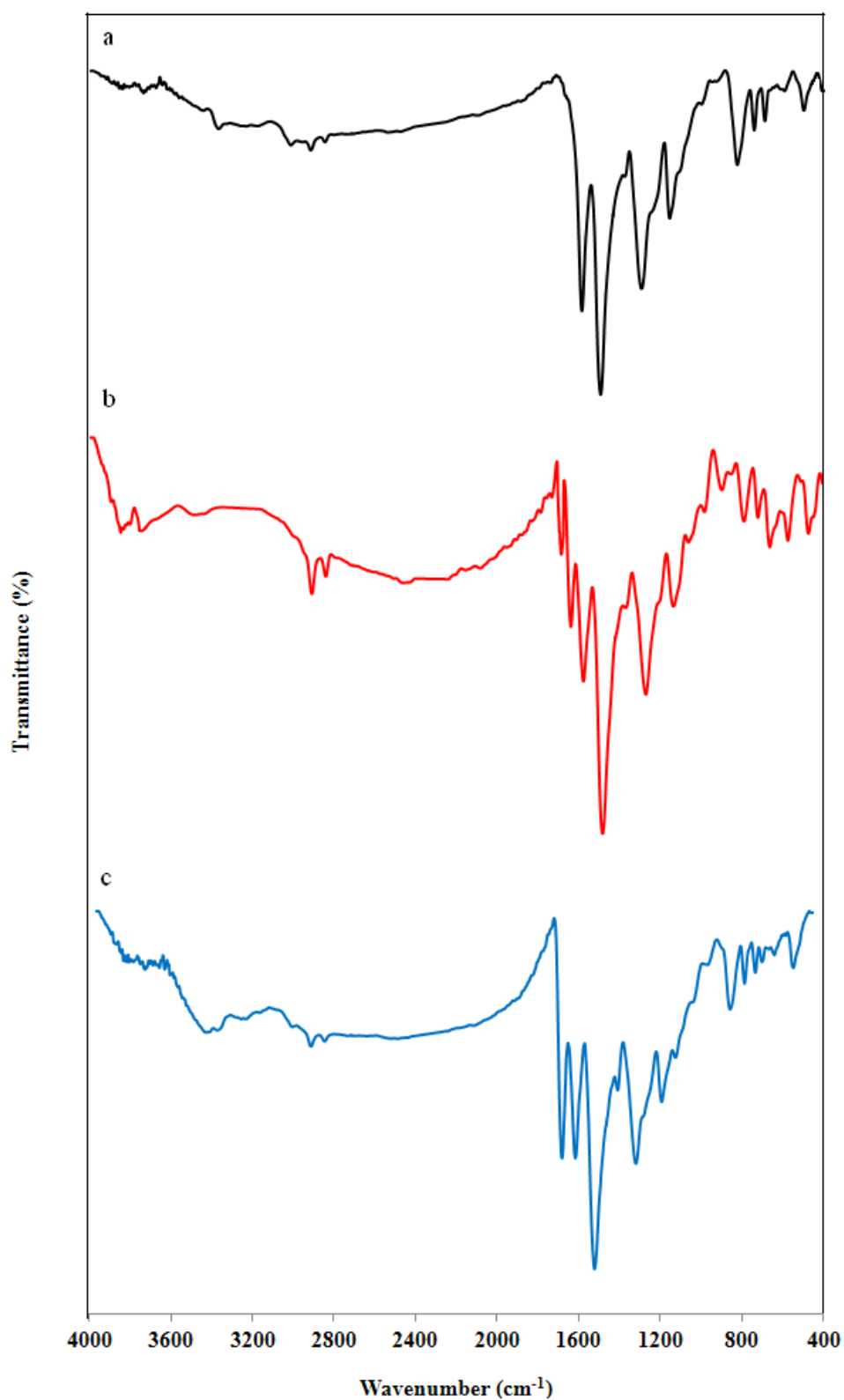


Figure S2: FTIR spectrum of (a) AT, (b) GA-AT, and (c) Si-AT

The strong band observed at around 300 nm was attributed to  $\pi$ - $\pi^*$  transition of the benzene rings. The weak and broad band appeared in the range of 550-680 nm is related to the benzenoid (B) to quinoid (Q)  $\pi_B$ - $\pi_Q$  excitonic transition.<sup>1</sup> Both GA-AT and Si-AT exhibited similar spectral pattern, despite the reaction of terminal amine group of AT molecule. Therefore, the electroactivity of these compounds was confirmed. Close inspection of Figure S3 showed lower Q/B intensity ratio for GA-AT and Si-AT than compared to AT. This phenomenon was attributed to the reduction of electronic concentration of the quinone units due to electron-withdrawing character of imine (-N=CH-) linkages.<sup>2</sup> Meanwhile, this observation confirmed the formation of GA-AT through coupling reaction of AT terminal amine group with aldehyde functionality of GA.

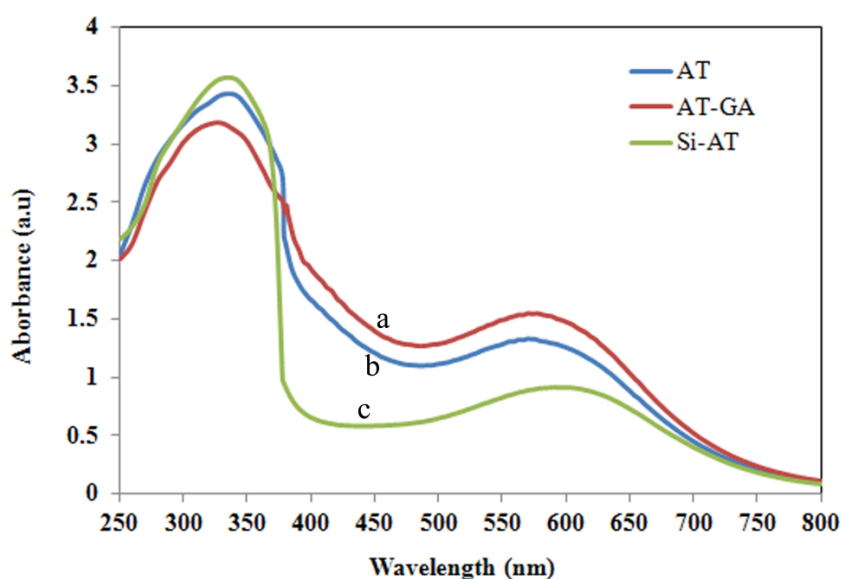


Figure S3: UV spectra of (a) AT, (b) GA-AT, and (c) Si-AT

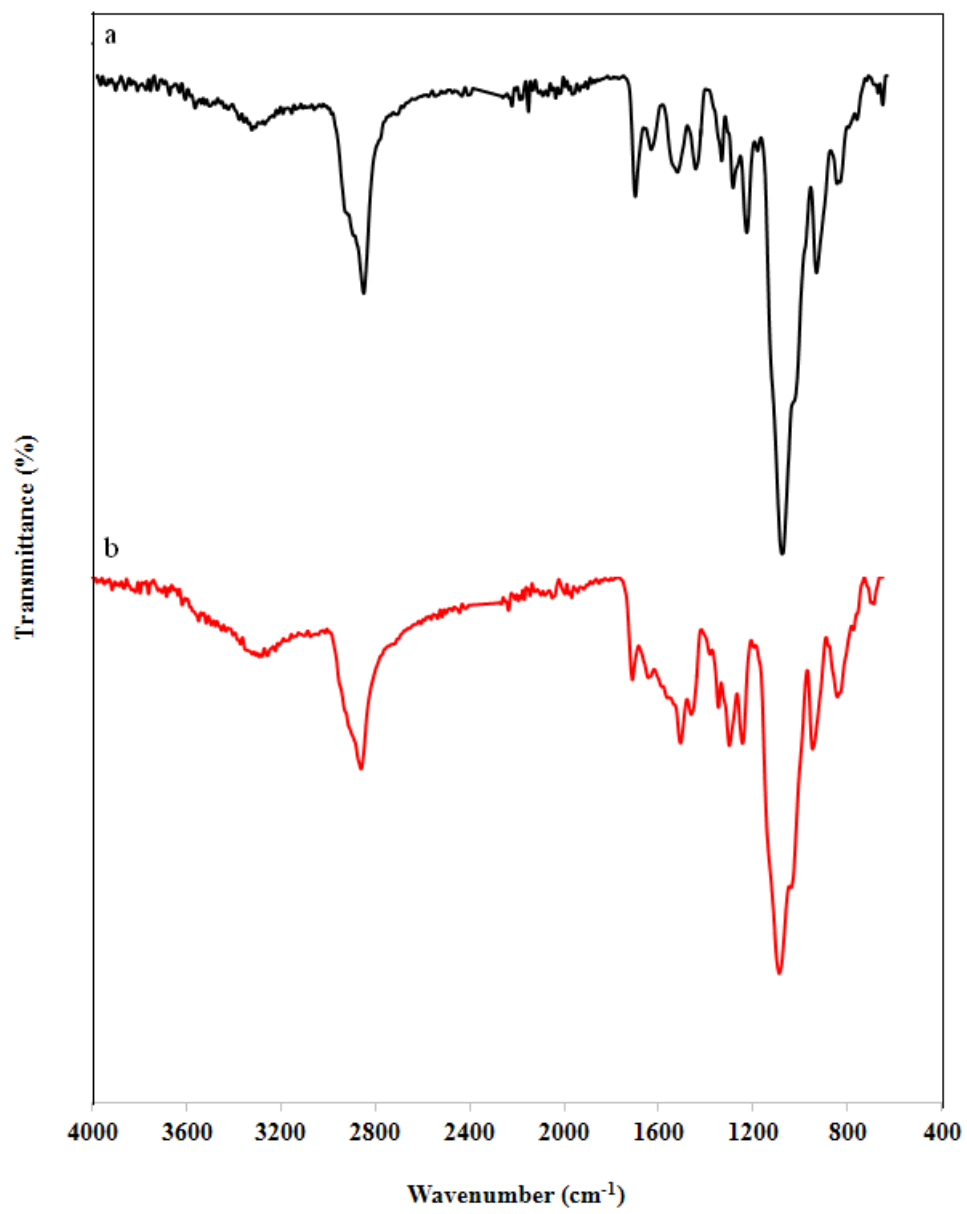


Figure S4: FTIR spectrum of 9a) NEPU and (b) EAPU2

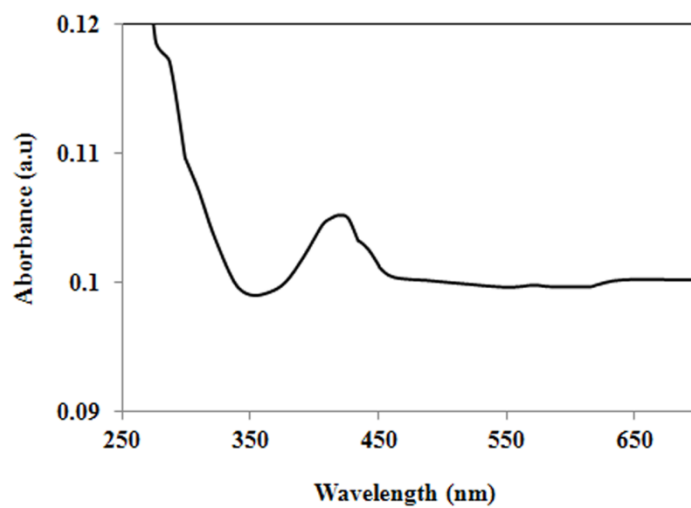


Figure S5: UV/Vis spectrum of the solution obtained from EAPU2-Ag extraction

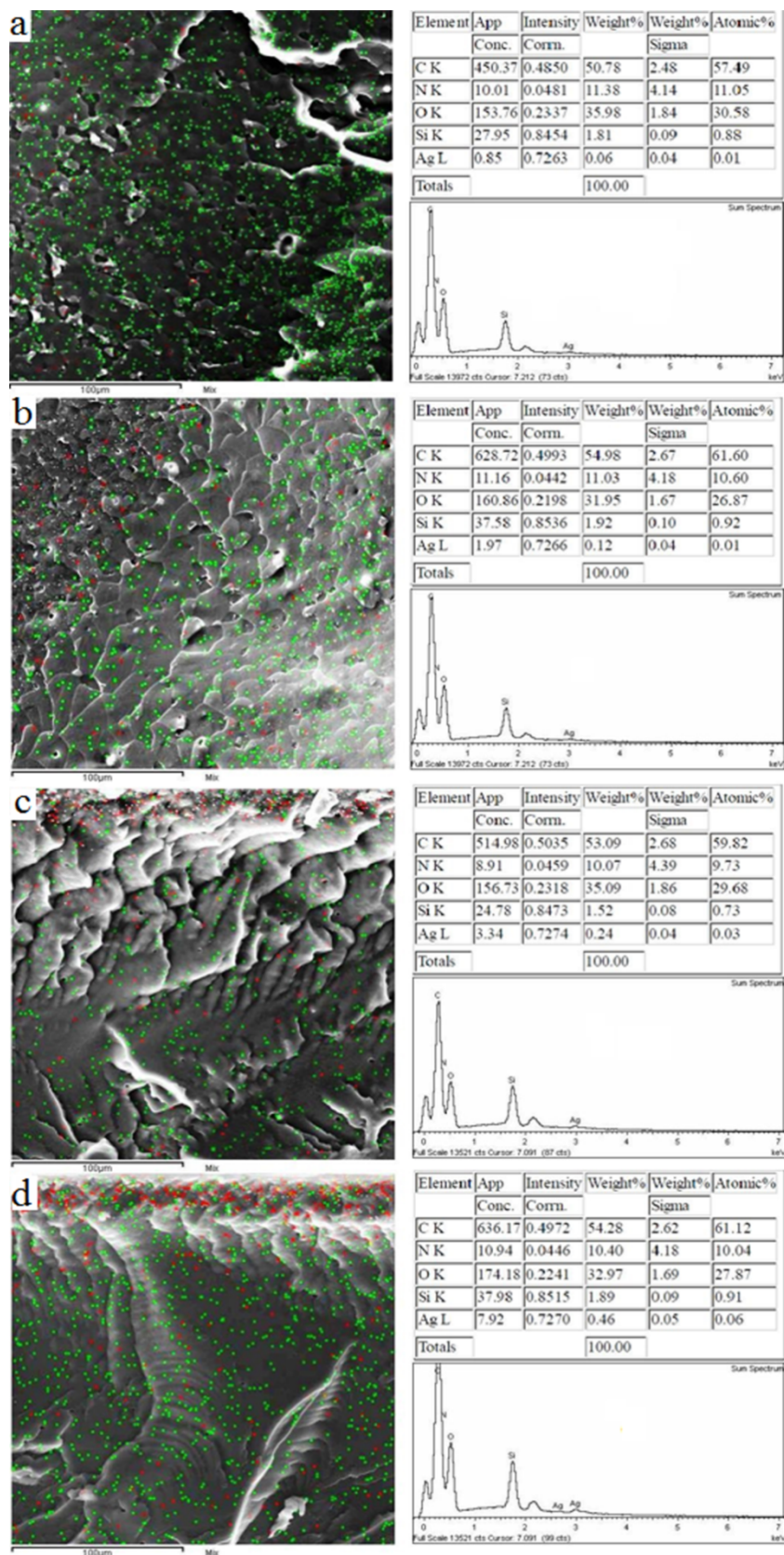


Figure S6: Silver and silicon maps on cross-section of (a) NEPU-Ag, (b) EAPU1-Ag, (c) EAPU2-Ag, (d) EAPU3-Ag.



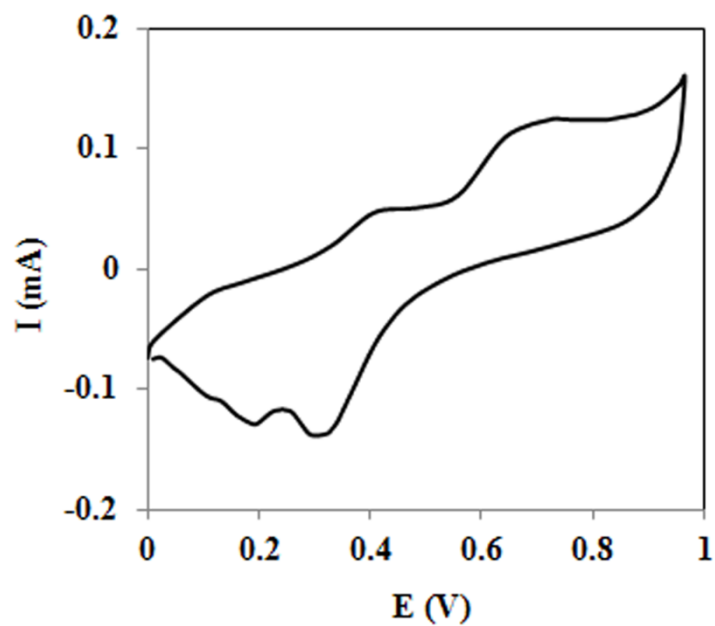


Figure S7: Cyclic voltammogram of EAPU2 membrane

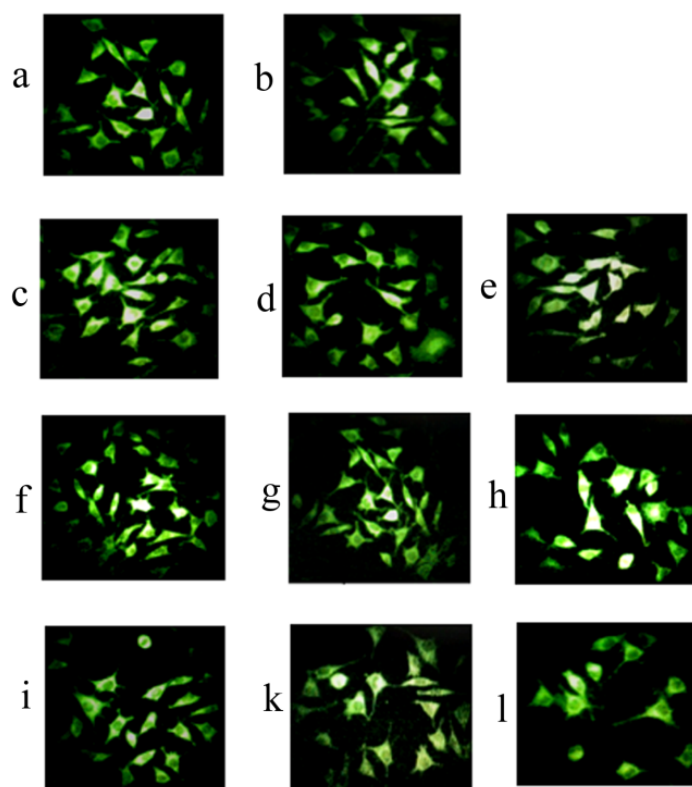


Figure S8: Fluorescence image of stained cells on (a) TCP, (b) NEPU, (c) EAPU1, (d) EAPU2, (e) EAPU3, (f) Doped EAPU1, (g) Doped EAPU2, (h) Doped EAPU3, (i) EAPU1-Ag, (k) EAPU2-Ag, (l) EAPU3-Ag.

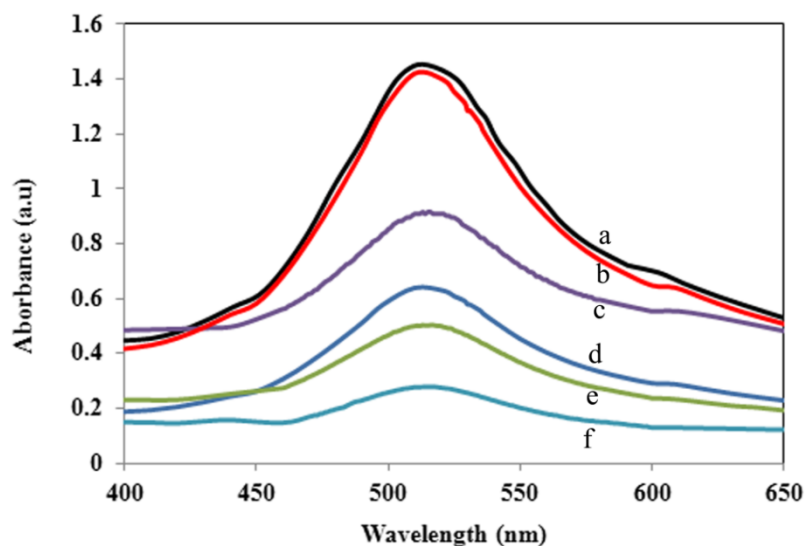


Figure S9: UV-vis spectra of mixtures containing (a) neat DPPH, (b) DPPH+NEPU (c) DPPH+EAPU1, (d) DPPH+EAPU2-Ag, (e) DPPH+EAPU2, (f) DPPH+EAPU3.

**Table S1:** Tensile properties of membranes <sup>x)</sup>

Sample	Tensile strength (Mpa)		Initial modulus (Mpa)		Elongation at break (%)	
	Dry	Wet	Dry	Wet	Dry	Wet
	NEPU	5.6±0.5 <sup>a</sup>	0.3±0.1 <sup>a</sup>	0.031±0.001 <sup>a</sup>	0.011±0.001 <sup>a</sup>	107± 2 <sup>a</sup>
EAPU1	7.5±0.7 <sup>b</sup>	0.8±0.1 <sup>b</sup>	0.048±0.001 <sup>b</sup>	0.018 ±0.002 <sup>b</sup>	96±3 <sup>b</sup>	26±3 <sup>b</sup>
EAPU2	10.2±1.2 <sup>c</sup>	3.1±0.4 <sup>c</sup>	0.114±0.015 <sup>c</sup>	0.076 ±0.005 <sup>c</sup>	83±3 <sup>c</sup>	47±5 <sup>c</sup>
EAPU3	11.2±1.1 <sup>c</sup>	3.7±0.2 <sup>c</sup>	0.431±0.025 <sup>d</sup>	0.101±0.006 <sup>d</sup>	65±5 <sup>d</sup>	45±4 <sup>c</sup>

<sup>x)</sup> According to analysis of variances P-values of < 0.05 were considered significant.. The difference between quantities with similar superscripts is not significant (p≥0.05) for data of each column.

**Table S2:** Bacterial reduction percent of the prepared membranes

Sample	<i>E. coli</i>	<i>S. aureus</i>	<i>P.aeruginosa</i>	<i>C. albicans</i>
NEPU	0	0	0	0
EAPU1	82	80	83	85
EAPU2	92	91	90	90
EAPU3	97	96	98	95
EAPU1-Ag	100	95	100	100
EAPU2-Ag	100	100	100	100
EAPU3-Ag	100	100	100	100

1. H. Wang, P. Guo, and Y. Han, *Macromol. Rapid Commun.*, 2006, **27**, 63–68.
2. B. Guo, A. Finne-Wistrand, and A.-C. Albertsson, *Biomacromolecules*, 2011, **12**, 2601–9.