SUPPORTING INFORMATION

Unimpeded permeation of water through biocidal graphene oxide sheets immobilized on to porous polyolefinic membranes

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Figure S1:. SEM micrographs of 50/50 wt/wt PE/PEO without maleated PE (a) and with maleated PE (b).
Figure S2: X-ray micro-computed tomogram of porous extruded PE (a), hot pressed uncompatibilized PE membrane (b), hot pressed PE with maleated PE membrane (c), tomogram showing the continuous channel in PE with maleated PE membrane (d) and sectional tomogram of porous PE after immobilization of GO in maleated PE in PE membrane (e).
Figure S3:. FTIR spectra of GO.
Figure S4: XPS wide spectra of untreated and GO immobilized PE.
Figure S5: The representative Raman spectra of PE and GO (a) and optical image of corresponding to the mapping (b).

Scanning Electron Microscopy (SEM)

Figure S1 exhibits the micrograph of porous PE membrane token without and with maleated PE after etching out the PEO phase. From figure S1a and b it is evident that in both the cases, the blends showed co-continuous morphology.

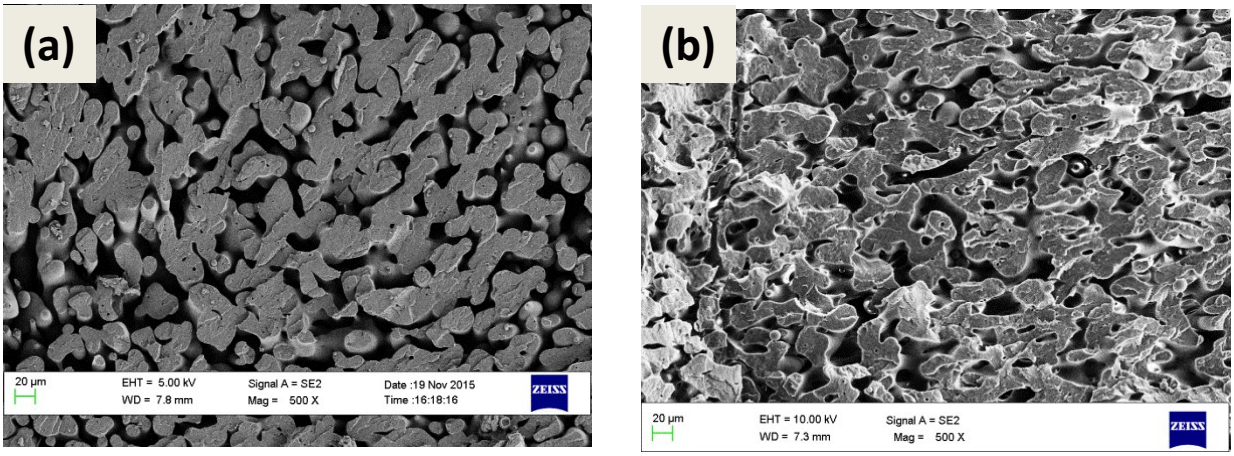

Figure S1. SEM micrographs of 50/50 wt/wt PE/PEO without maleated PE (a) and with maleated PE (b).

3D tomography

Figure S2 shows the representative 3D reconstructed images of porous PE (figure S2a) as extruded, hot pressed PE membrane (figure S2b), hot pressed compatibilized PE membrane (figure S2c). From the tomograms, it is clear that as extruded porous PE blends, after etching out the PEO phase forms a co-continuous type of morphology. However, upon hot pressing, the uncompatibilized blends exhibit a typical sea island type of morphology. From the annealing results, it is understood that addition of maleated PE results in stabilization of morphology. The compatibilization of blend resulted in retaining co-continuous morphology (figure 1c) even after post processing operations like compositing. Further, from figure S2d, the yellow dashed line confirms the presence of continuous channels that will help in better transport properties. We would like to state that the surface functionalization occurs on the pores as well besides the surface. This can result in anchoring of the GO sheets near the pores. From the figure S2e (the sliced tomograph of GO immobilized PE membranes), it is evident that the GO sheets are anchored near the pores as well. Thus the anchoring of GO sheets can effectively prohibit fouling. This is also manifested from the antibacterial studies.

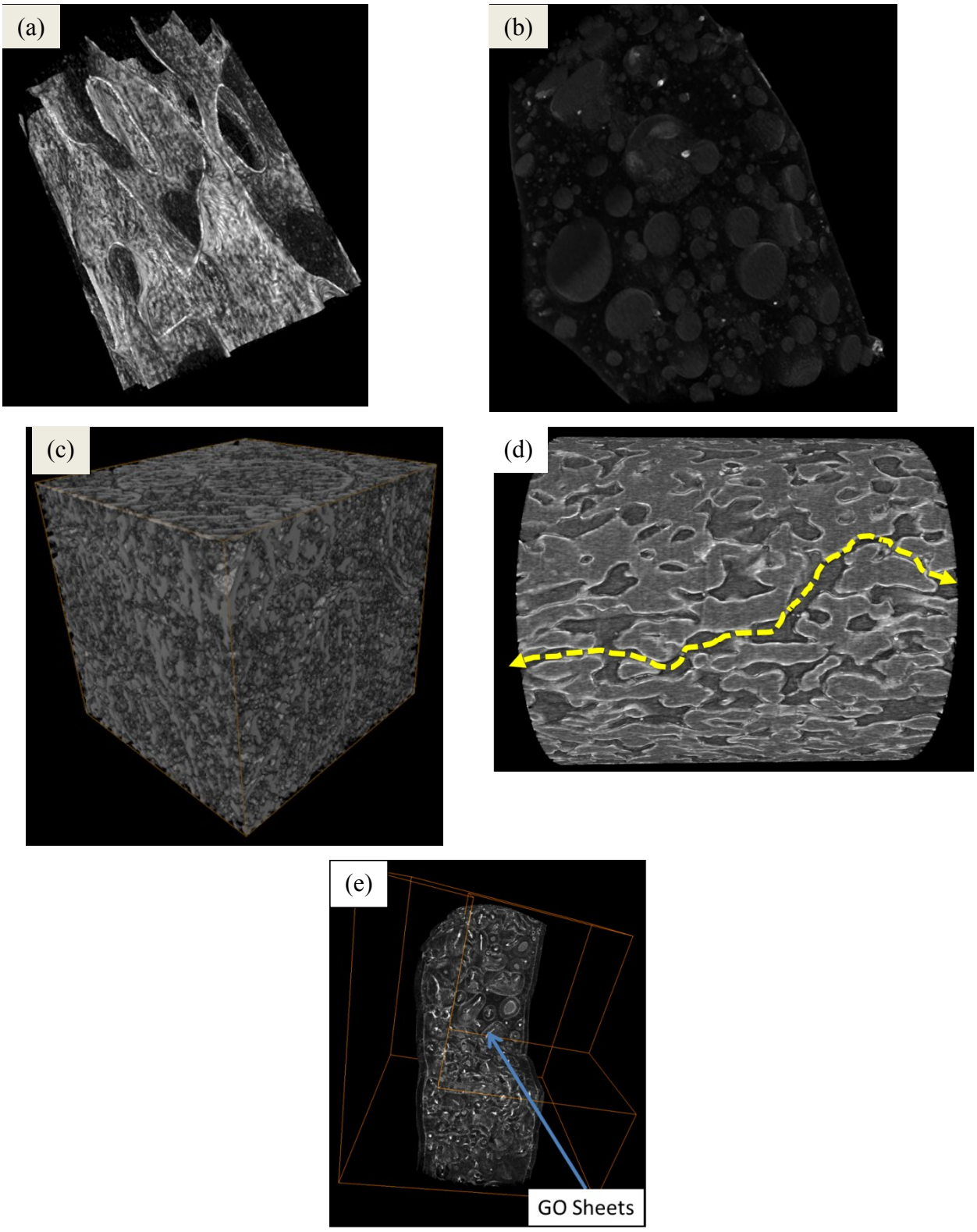

Figure S2. X-ray micro-computed tomogram of Porous PE (a), hot pressed uncompatibilized PE membrane (b), hot pressed with maleated PE in PE membrane (c), tomogram showing the

continuous channel in maleated PE in PE membrane (d) and sectional tomogram of porous PE after immobilization of GO in maleated PE in PE membrane (e).

Fourier Transfer Infrared (FTIR)

The graphene oxide (GO) immobilization on the PE surface was obtained by conjugation of carboxyl group of GO with free amine[19]. This is evident from figure S3a which manifest signature peaks at 1728 cm^{-1} (attributed to C=O carbonyl stretching broad), hydroxyl group at 3000 – 3700 and sp^2 hybridized (C=C) in plane vibration at 1638 cm^{-1}.

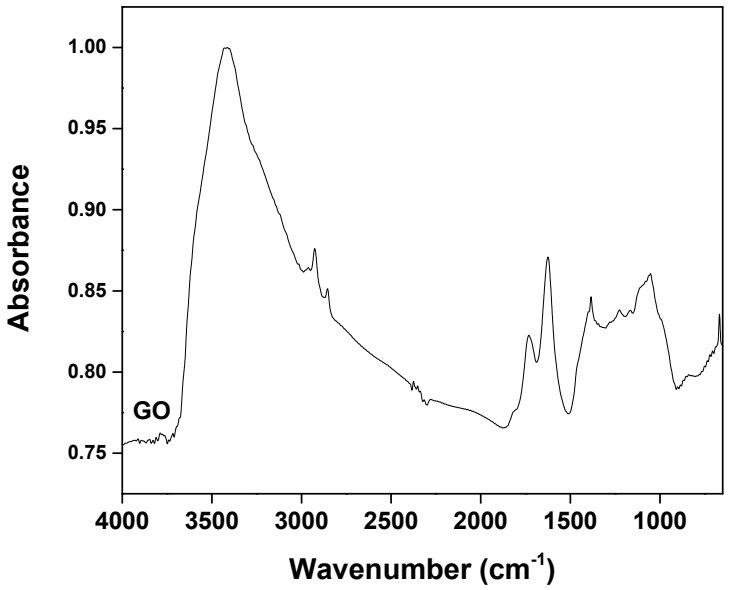

Figure S3. FTIR spectra of GO

X-ray photoelectron spectroscopy (XPS)

The amine functionalization followed by amidation with GO was confirmed by XPS. From figure S4, it is evident that wide scan exhibited appearance of N-1s of nitrogen peak for PE-NH_2 and GO immobilized PE, thus confirming the presence of nitrogen on the surface.

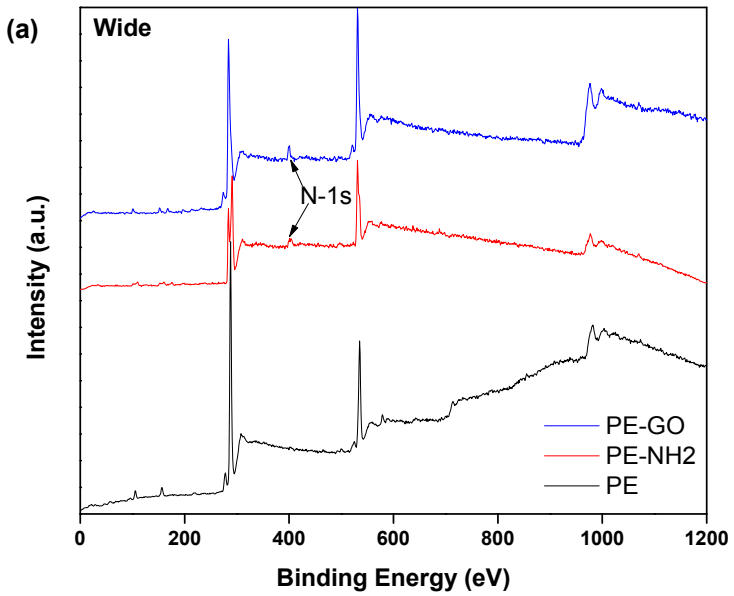

Figure S4. XPS wide spectra of untreated and GO immobilized PE.

Raman spectroscopy

Figure S5a shows the Raman spectra of untreated PE and GO. From figure S5a it is evident that GO exhibited a peak at 1318 cm^{-1} which is attributed to defective band of graphitic structure and a peak at 1590 cm^{-1} corresponding to graphitic structure (Mural, P. K. S.; Sharma, M.; Shukla, A.; Bhadra, S.; Padmanabhan, B.; Madras, G.; Bose, S., Porous Membranes designed from bi-phasic polymeric blends containing Silver decorated reduced Graphene Oxide synthesized via a facile one-pot Approach. *RSC Advances* **2015,** 32441-32451).

Raman mapping was employed to quantify the area covered by GO on the membrane surface. Raman mapping was done over an area of 20 μm × 10 μm with individual spectra at point of 9 × 8 spread over (as shown in figure S5b).

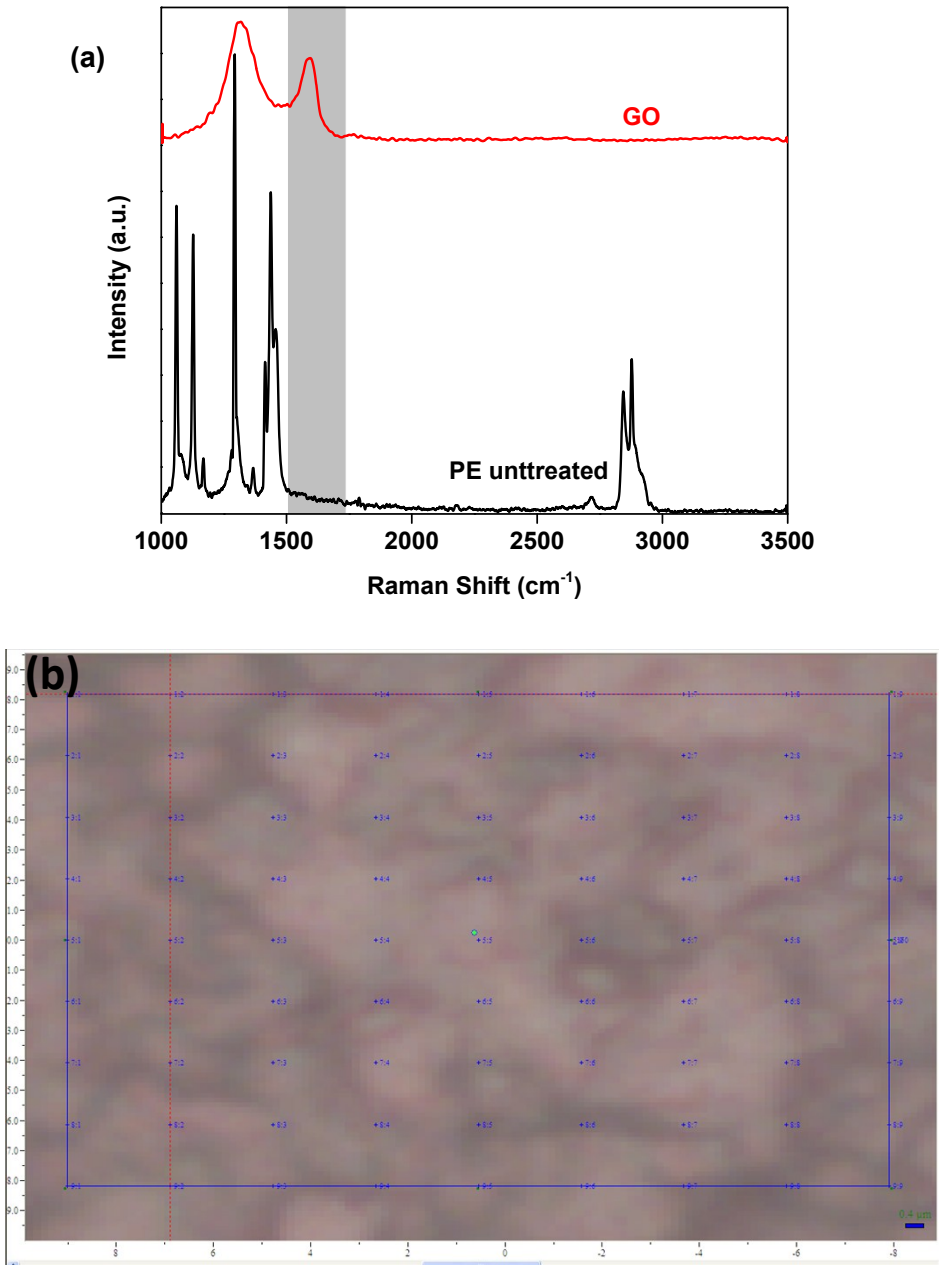

Figure S5. The representative Raman spectra of PE and GO (a) and optical image of corresponding to the mapping (b)