

Supplementary

Structural, Mechanical, and Tribological Properties of Oriented Ultra-High Molecular Weight Polyethylene/Graphene Nanoplates/Polyaniline Films

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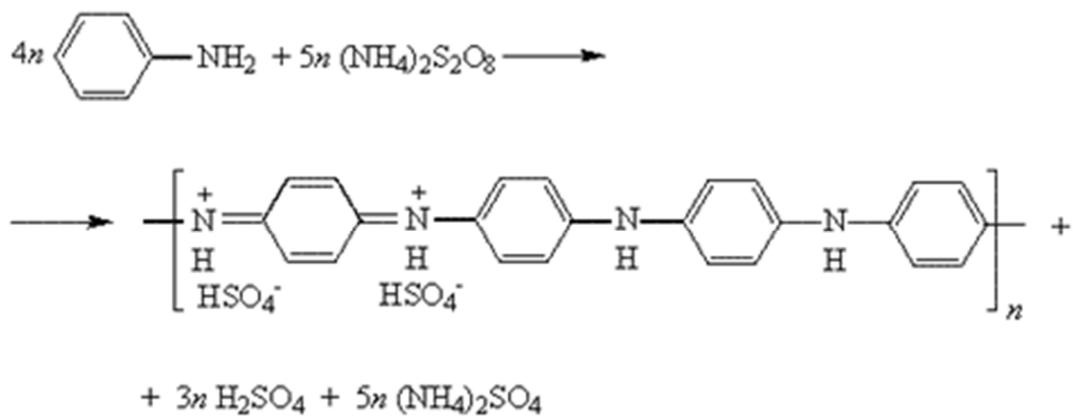


Figure S1. The scheme of oxidative polymerization of aniline [20].

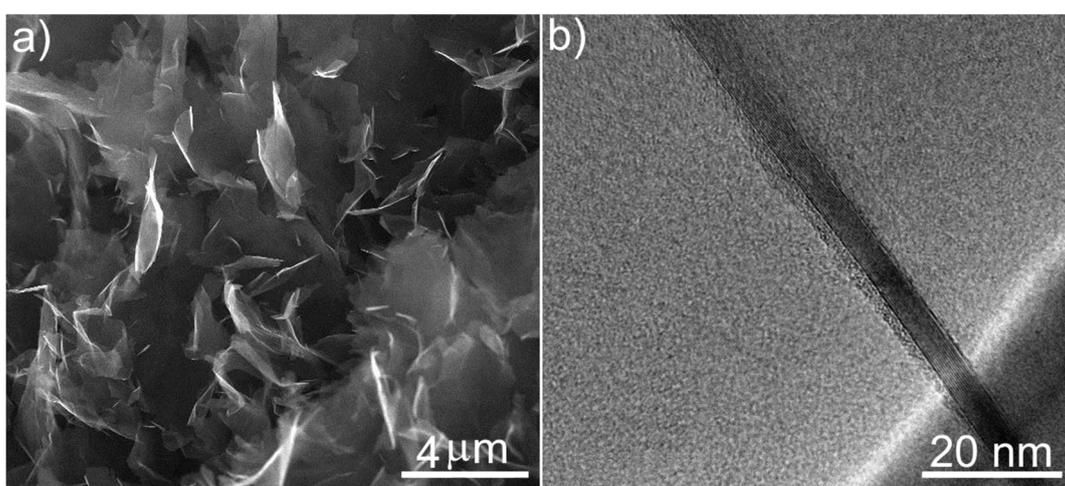


Figure S2. (a) SEM and (b) TEM micrographs of GNP microstructure [20].

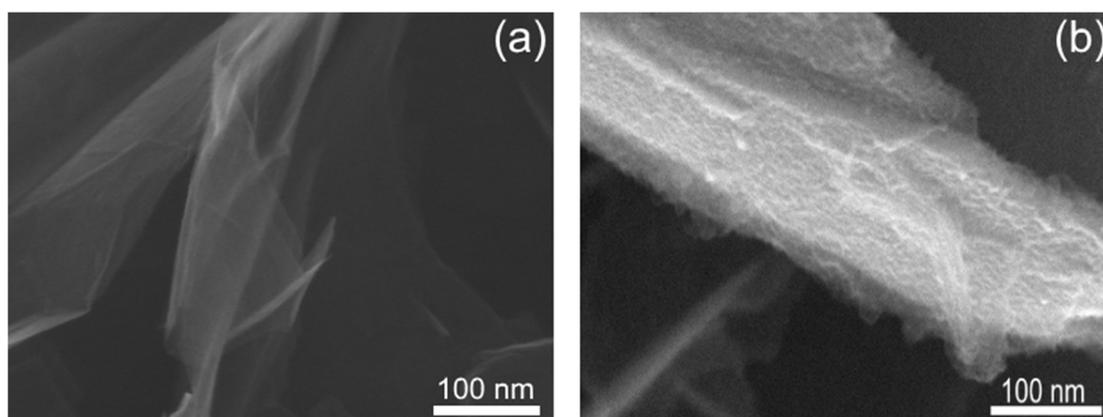


Figure S3. SEM micrograph of the (a) unmodified GNP and (b) modified GNP by PANI [20].

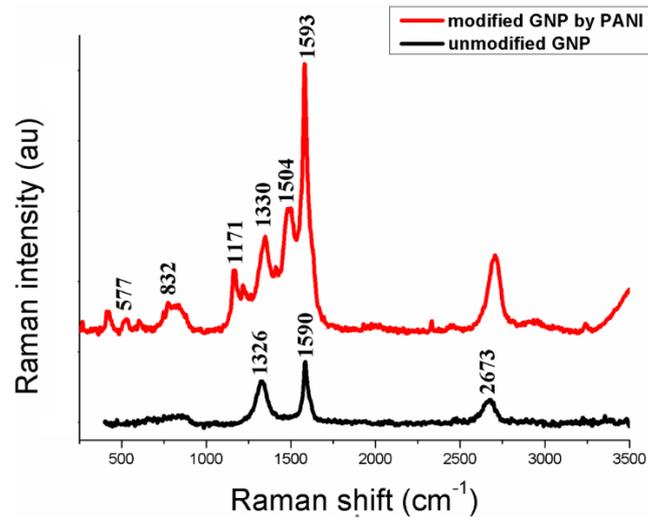


Figure S4. Raman spectra of (a) unmodified GNP and (b) modified GNP by PANI [20].

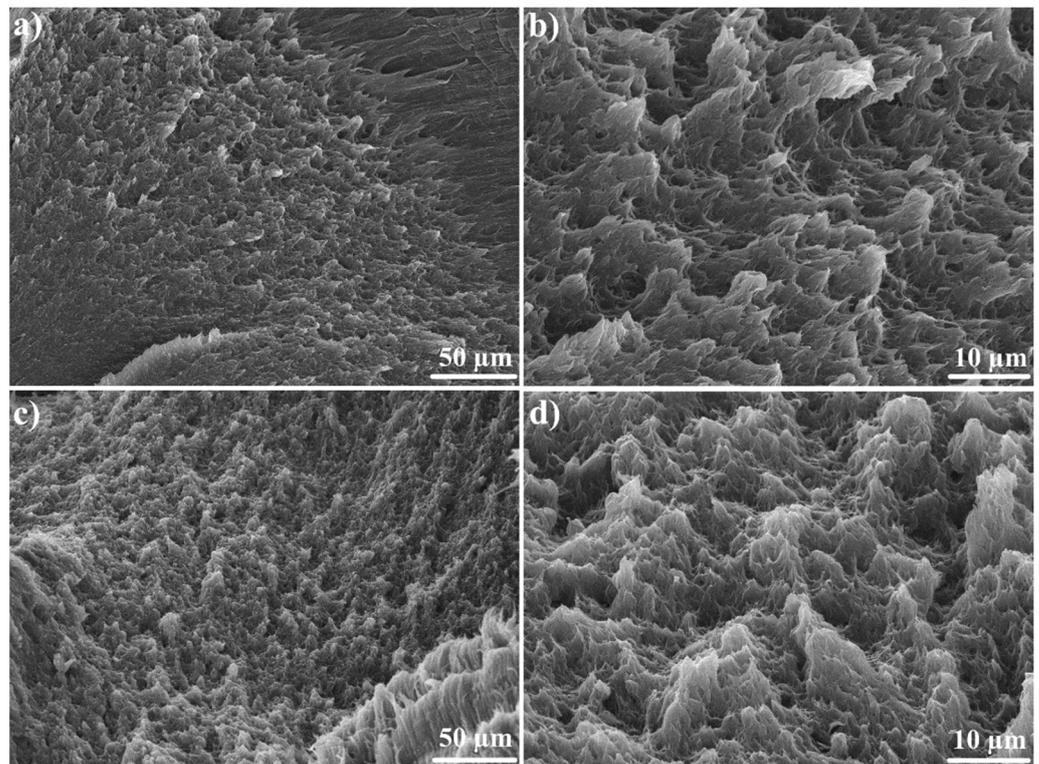
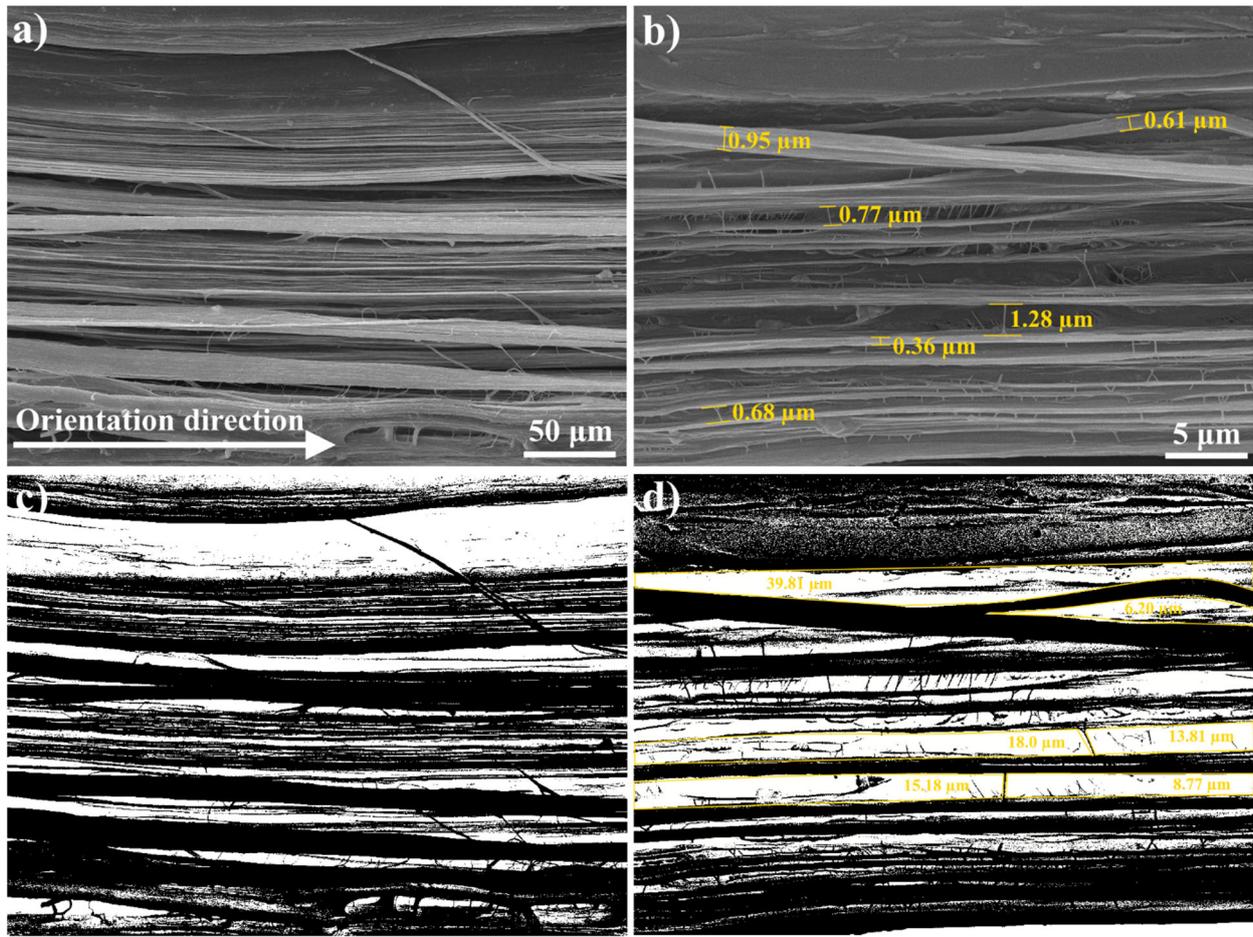
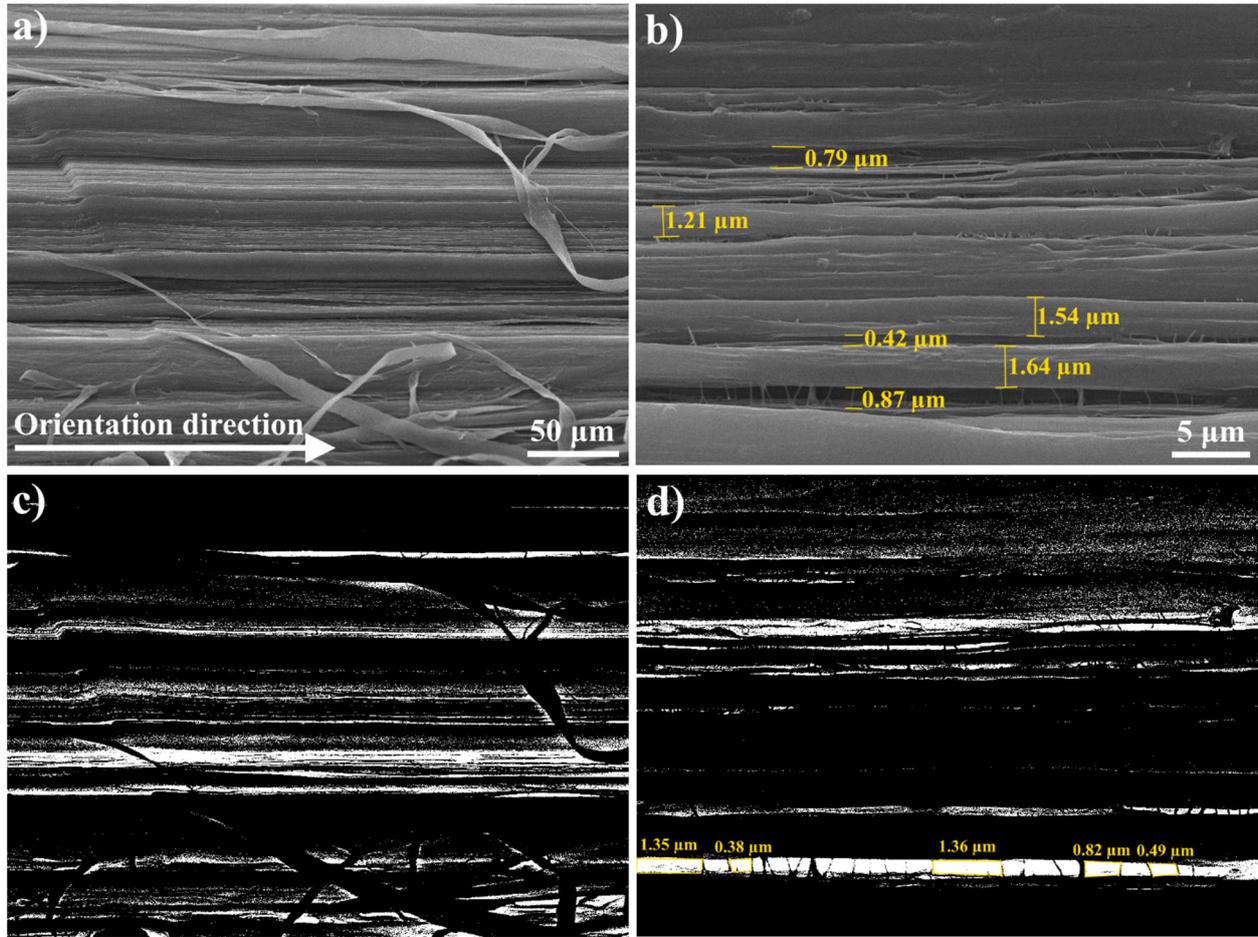


Figure S5. SEM micrographs showing typical supra-molecular structure of (a, b) UHMWPE /1.0 wt. % PE-wax/ 0.01 wt. % GNP/PANI, and (c, d) UHMWPE /1.0wt. % PE-wax/ 2.0 wt.% GNP/PANI xerogels.



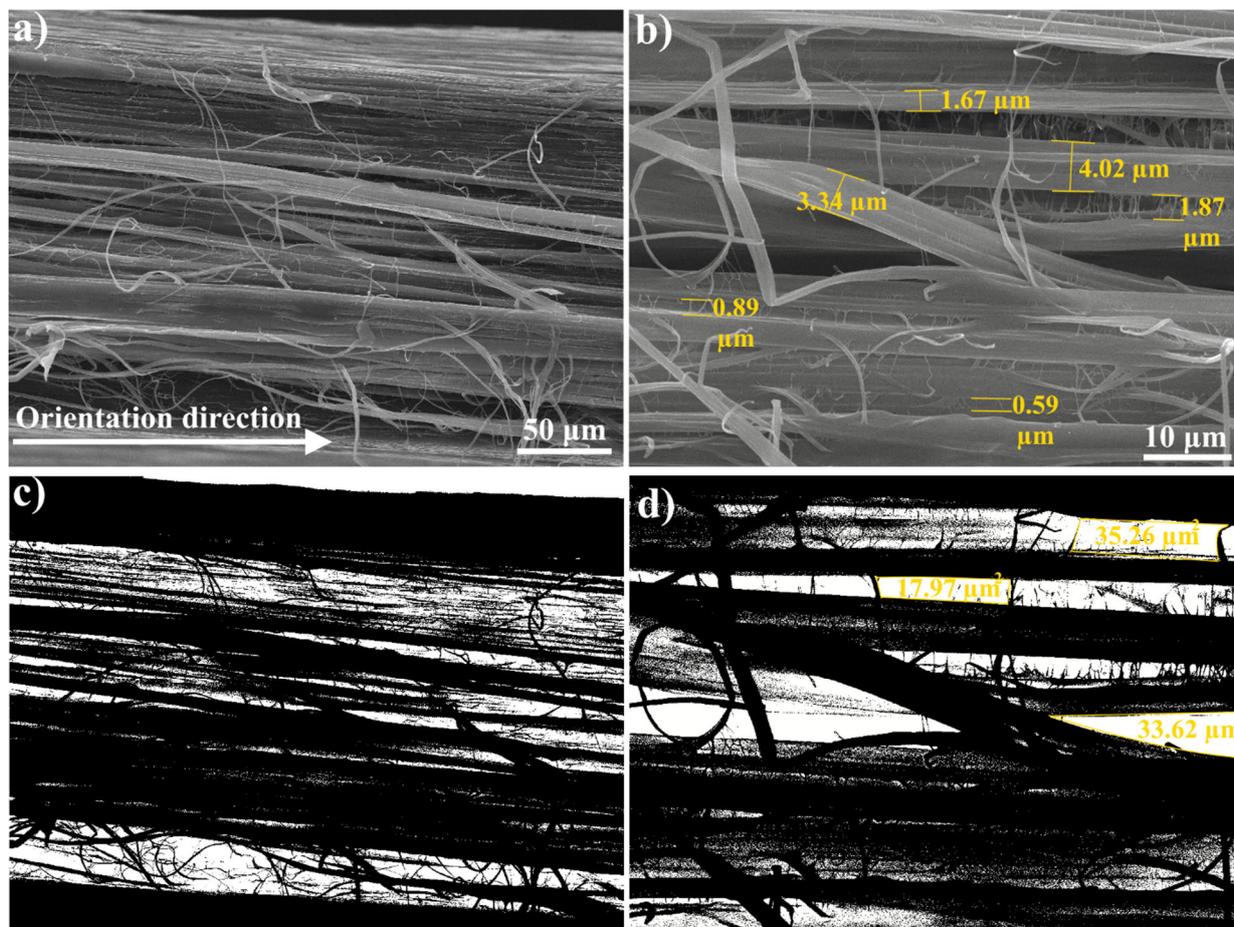
Cavitation area in percentage = 38 ± 2 %

Figure S6. SEM micrographs of fibrillar structure for virgin UHMWPE films obtained by first thermal orientation regime (a, b), (c, d) modified SEM images using the image J program. The average pore size is 1.2 ± 0.2 μm .



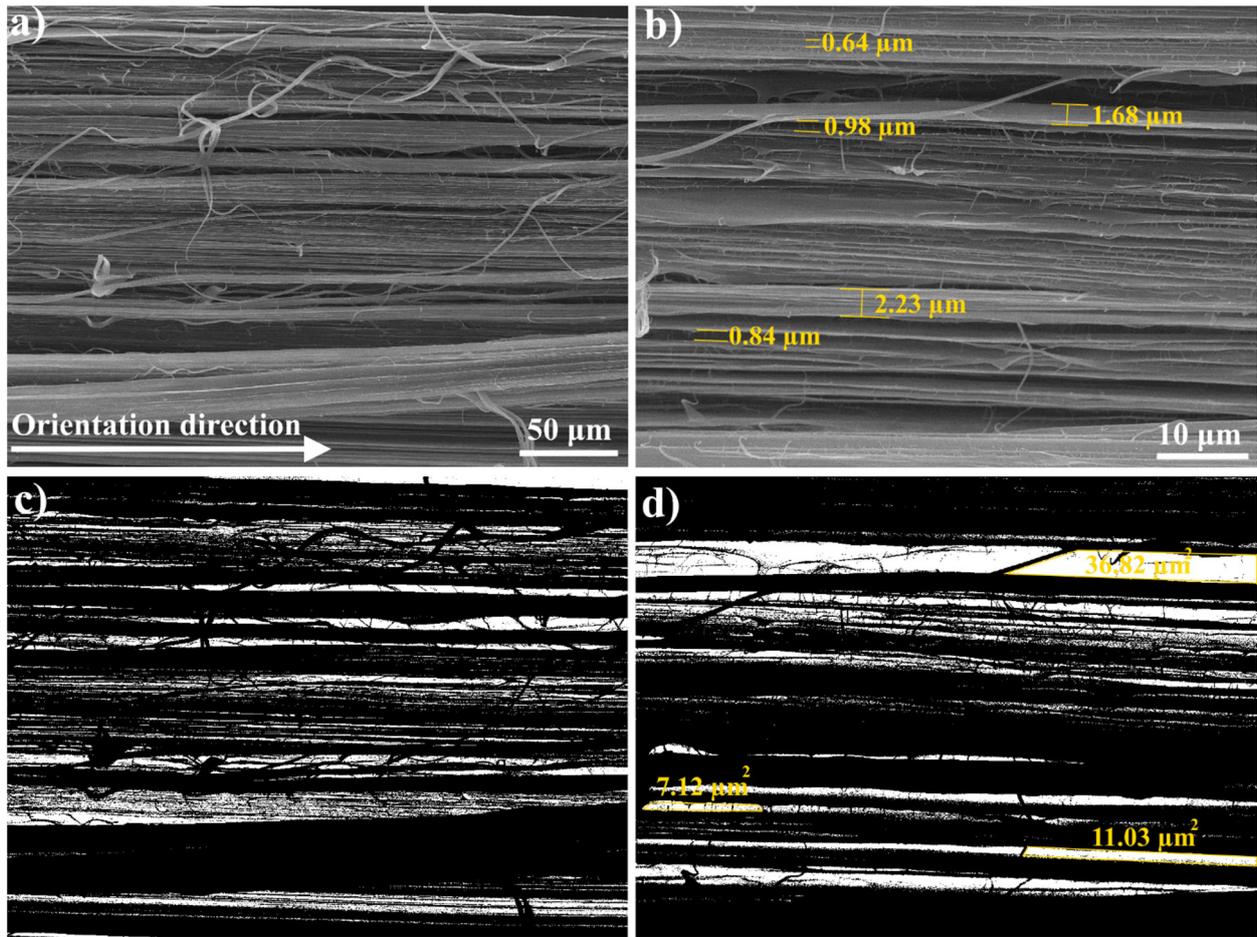
Cavitation area in percentage = 10 ± 1 %

Figure S7. SEM micrographs of fibrillar structure for UHMWPE/1.0 wt. % PE-wax films obtained by first thermal orientation regime (a, b), (c, d) modified SEM images using the image J program. The average pore size is 0.8 ± 0.2 μm .



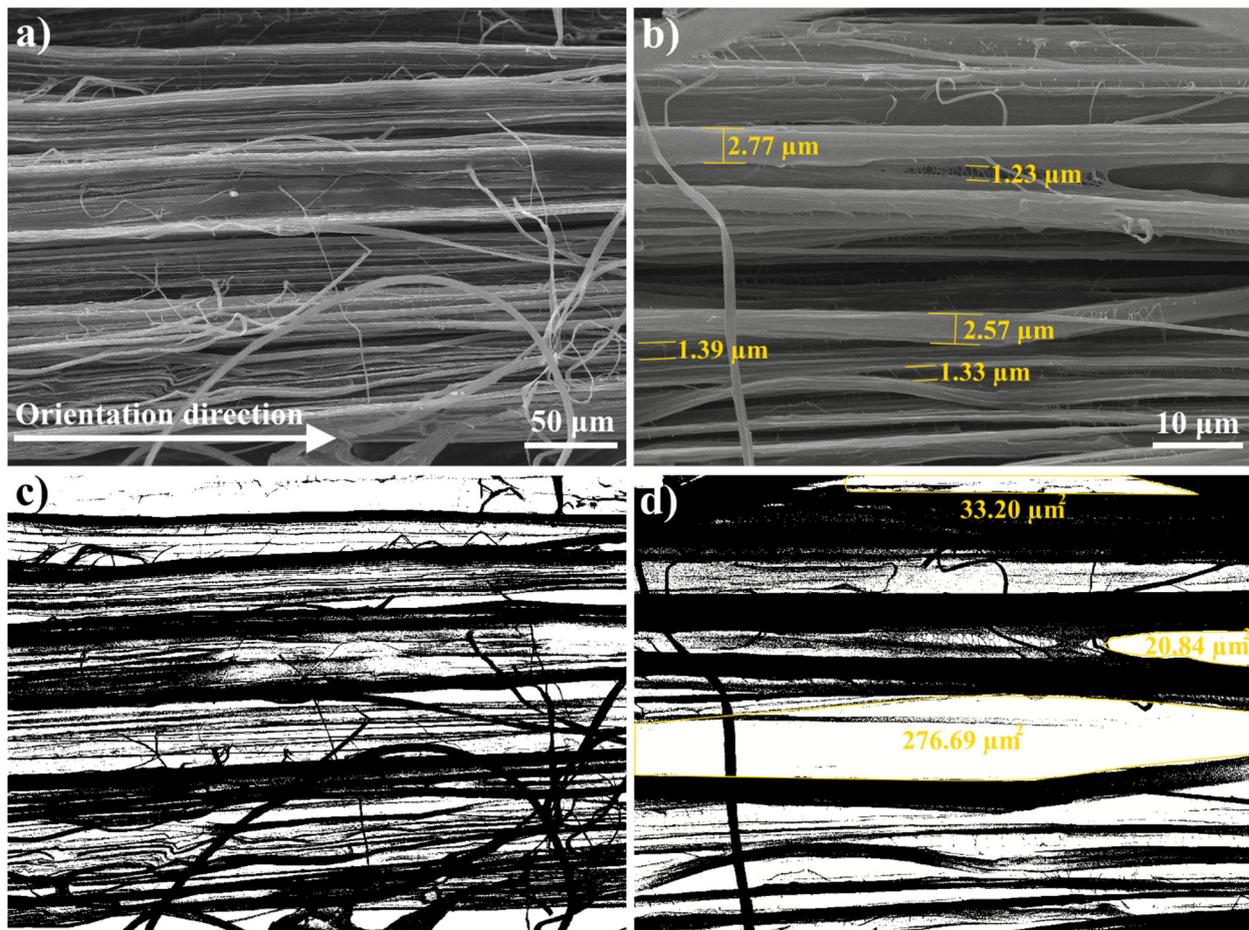
Cavitation area in percentage = 22 ± 2 %

Figure S8. SEM micrographs of fibrillar structure for UHMWPE /1.0 wt. % PE-wax/ 0.01 wt. % GNP/PAN films obtained by first thermal orientation regime (a, b), (c, d) modified SEM images using the image J program. The average pore size is 3.4 ± 0.5 μm .



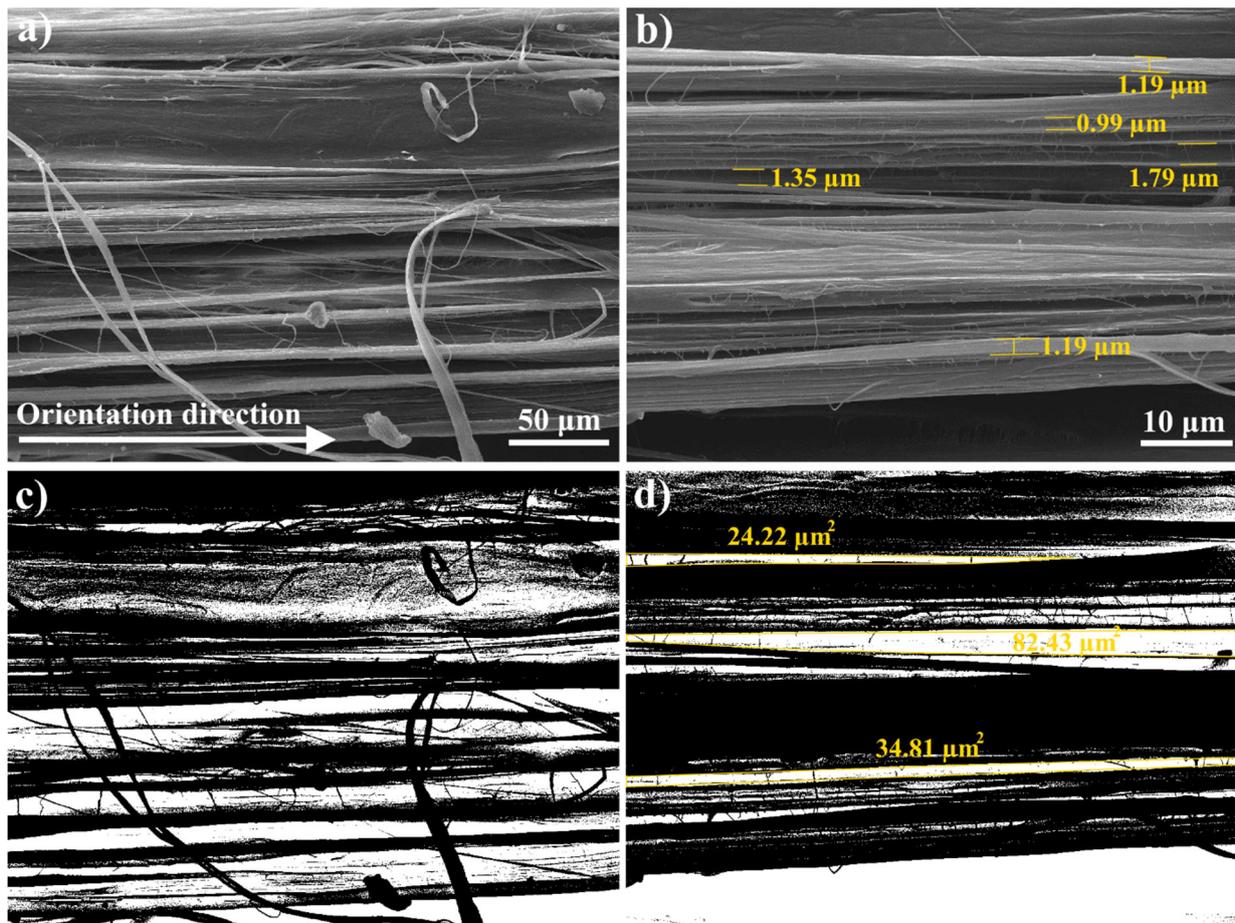
Cavitation area in percentage = $17 \pm 1 \%$

Figure S9. SEM micrographs of fibrillar structure for UHMWPE /1.0 wt. % PE-wax/ 0.01 wt. % GNP/PAN films obtained by second thermal orientation regime (a, b), (c, d) modified SEM images using the image J program. The average pore size is $1.8 \pm 0.2 \mu\text{m}$.



Cavitation area in percentage = $42 \pm 1 \%$

Figure S10. SEM micrographs of fibrillar structure for UHMWPE /1.0 wt. % PE-wax/ 2.0 wt. % GNP/PANI films obtained by first thermal orientation regime (a, b), (c, d) modified SEM images using the image J program. The average pore size is $3.7 \pm 0.4 \mu\text{m}$.



Cavitation area in percentage = 34 ± 2 %

Figure S11. SEM micrographs of fibrillar structure for UHMWPE /1.0 wt. % PE-wax/ 2.0 wt. % GNP/PAN films obtained by second thermal orientation regime (a, b), (c, d) modified SEM images using the image J program. The average pore size is 2.2 ± 0.3 μm .