Boosting Triboelectric Charge Generation Using High-Performance Functional MAX phase Nanofillers Incorporated in Silicone Elastomers

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Supplementary Information

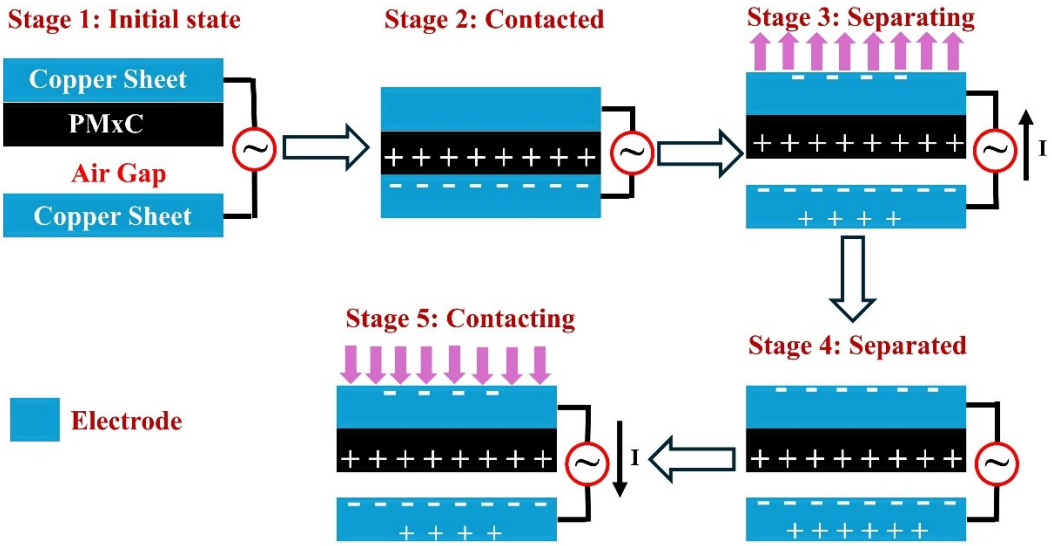


Figure S1: Working mechanism of TENG.

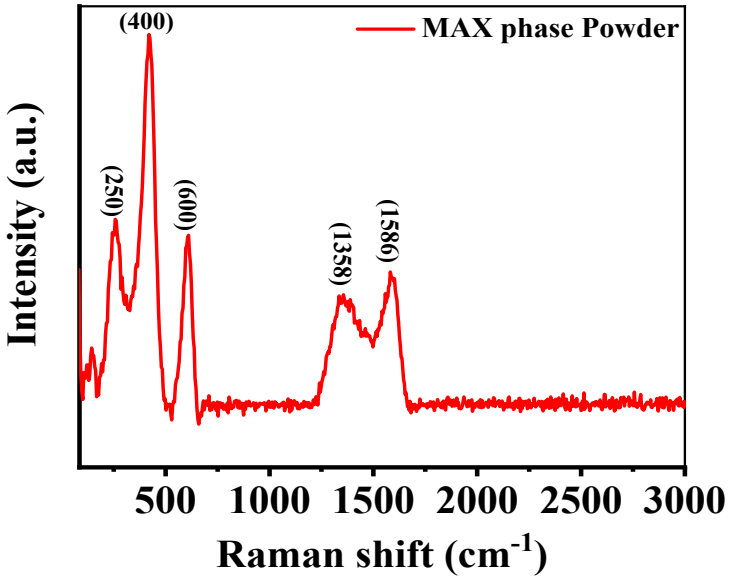


Figure S2: Raman Spectra of pure MAX phase powder.

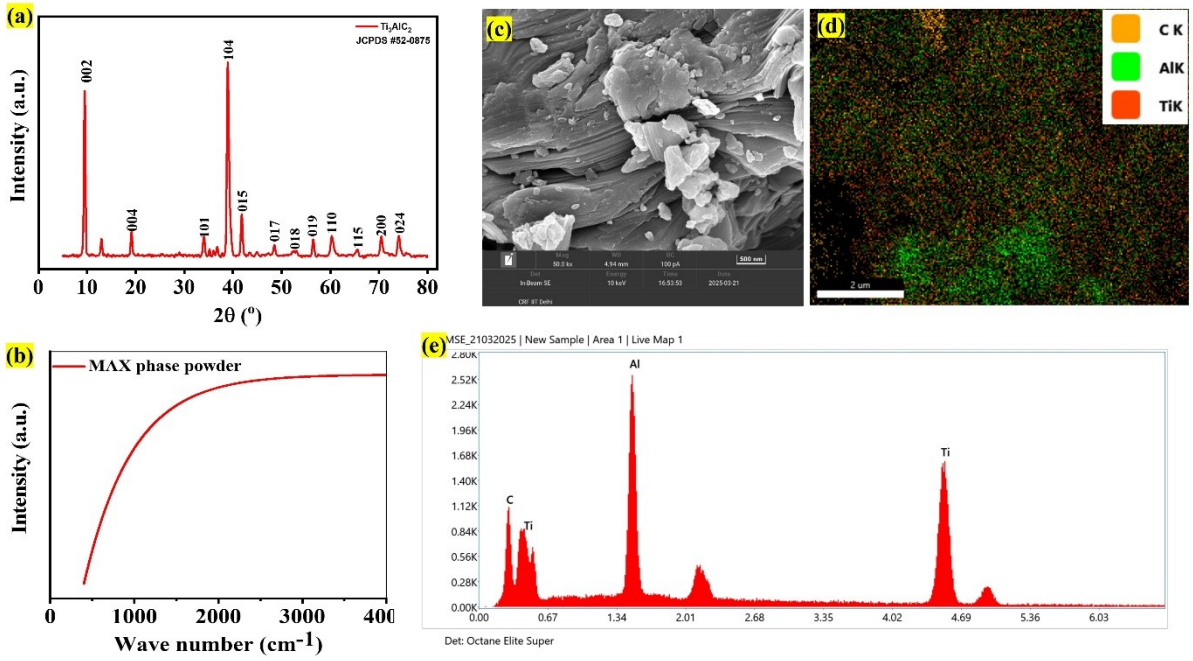
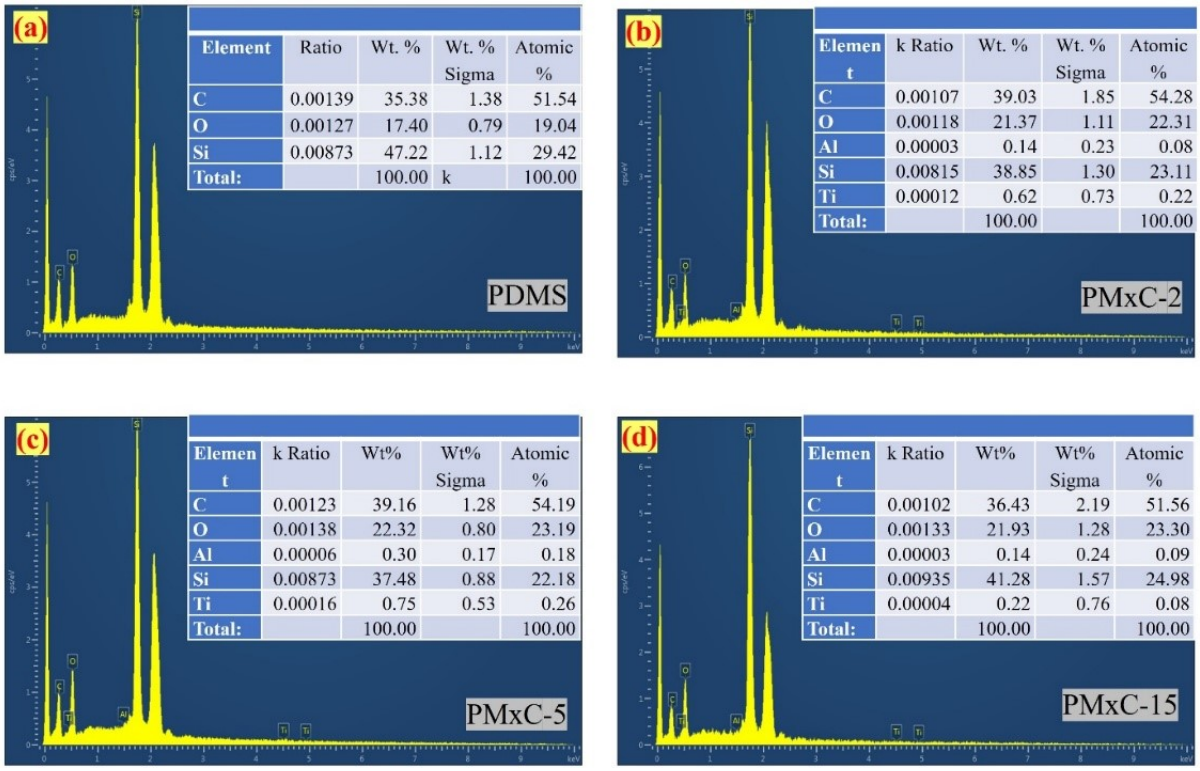


Figure S3: MAX phase powder characterization (a) x-ray diffraction, (b) FT-IR, (c) FESEM image, (d) mapping of elemental components, and (e) EDX.



(a)

Element	Ratio	Wt. %	Wt. % Sigma	Atomic %
C	0.00139	35.38	1.38	51.54
O	0.00127	17.40	0.79	19.04
Si	0.00873	47.22	1.12	29.42
Total:		100.00	k	100.00

(b)

Element	k Ratio	Wt. %	Wt. % Sigma	Atomic %
C	0.00107	39.03	1.85	54.28
O	0.00118	21.37	1.11	22.31
Al	0.00003	0.14	0.23	0.08
Si	0.00815	38.85	1.30	23.11
Ti	0.00012	0.62	0.73	0.22
Total:		100.00		100.00

(c)

Element	k Ratio	Wt%	Wt% Sigma	Atomic %
C	0.00123	39.16	1.28	54.19
O	0.00138	22.32	0.80	23.19
Al	0.00006	0.30	0.17	0.18
Si	0.00873	37.48	0.88	22.18
Ti	0.00016	0.75	0.53	0.26
Total:		100.00		100.00

(d)

Element	k Ratio	Wt%	Wt% Sigma	Atomic %
C	0.00102	36.43	2.19	51.56
O	0.00133	21.93	1.28	23.30
Al	0.00003	0.14	0.24	0.09
Si	0.00935	41.28	1.57	24.98
Ti	0.00004	0.22	0.76	0.08
Total:		100.00		100.00

Figure S4: EDX of (a) Pure PDMS, (b) PMxC-2, (c) PMxC-5, and (d) PMxC-15.

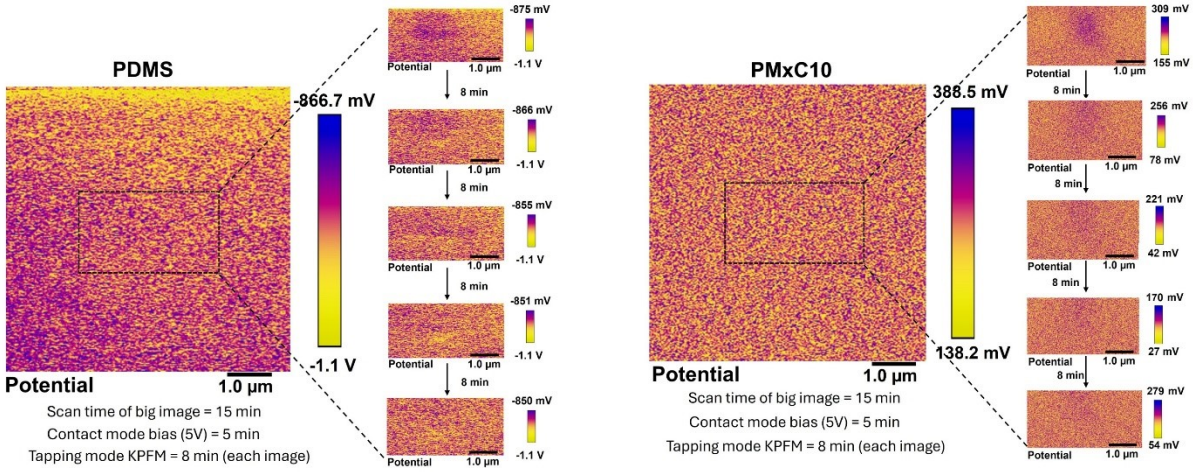


Figure S5: surface potential evolution of pristine PDMS and the PMxC-10 membrane measured during the charging interval.

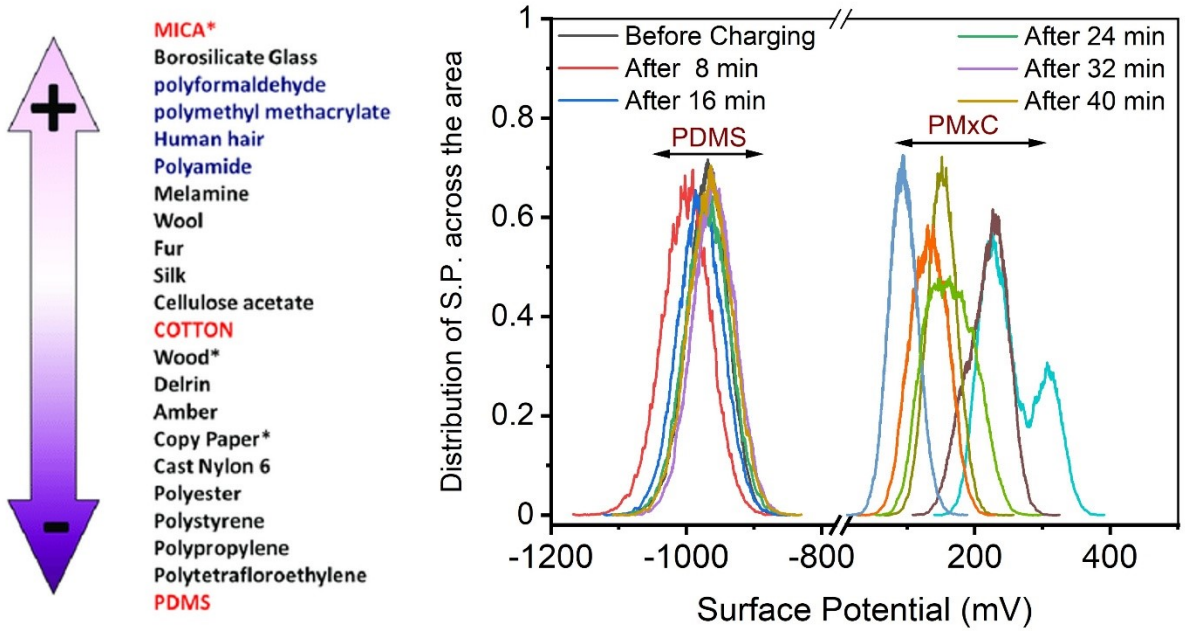


Figure S6: (a) Comparison of materials in the triboelectric series, and (b) surface potential evolution of pristine PDMS and the PMxC-10 membrane measured during the charging interval.

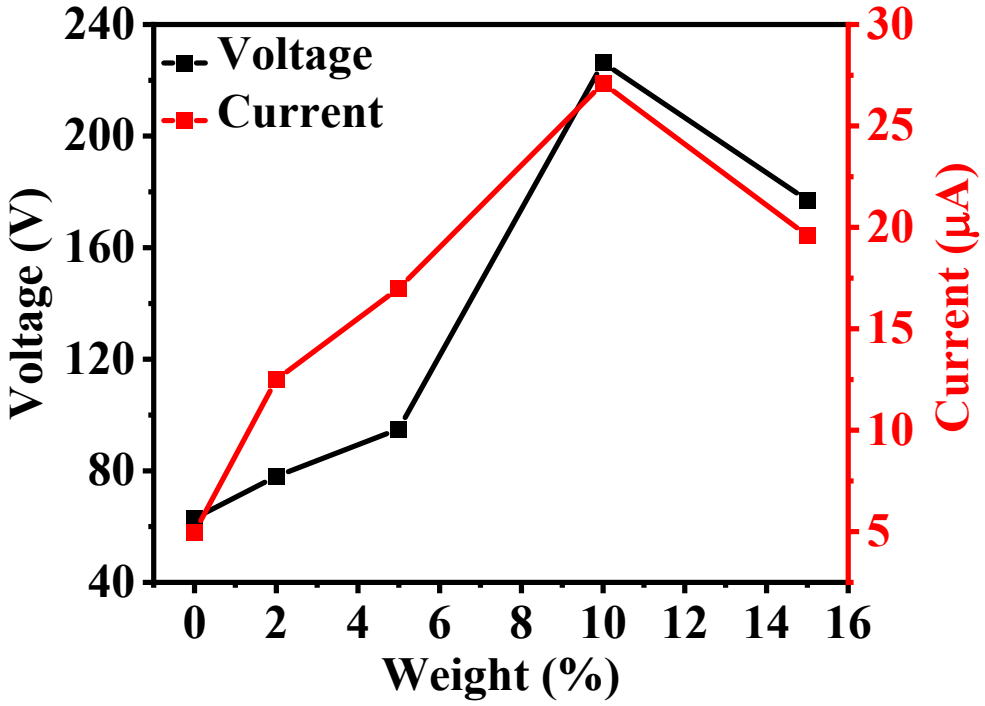


Figure S7: Output Voltage and current at different weight percentages of MAX phase.

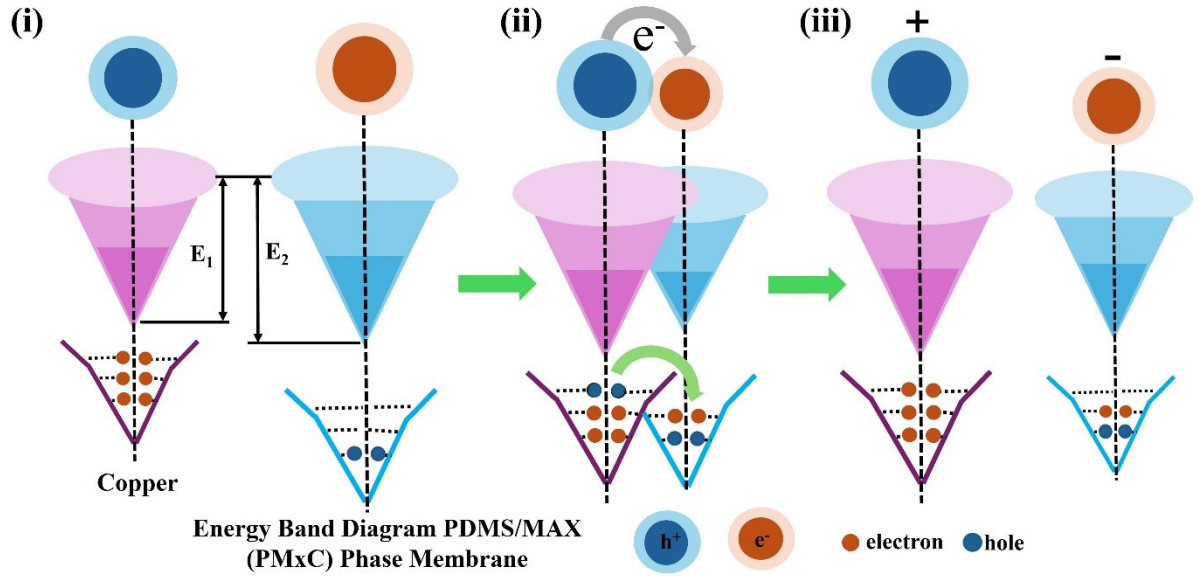


Figure S8: Charge transfer between PDMS and MAX phase.

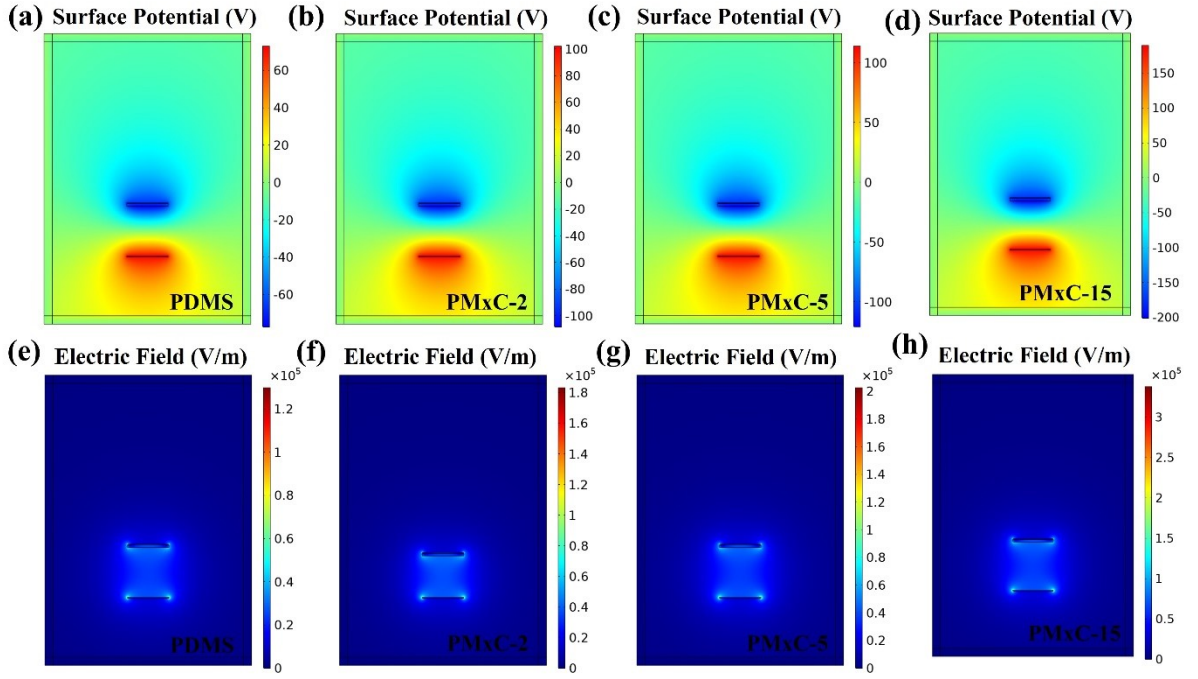


Figure S9: COMSOL simulation for CS mode TENG considering composite configuration of Surface Potential Difference (a-d) and Electric Field considering minimum to maximum separation distance between two dielectric layers (e-h).

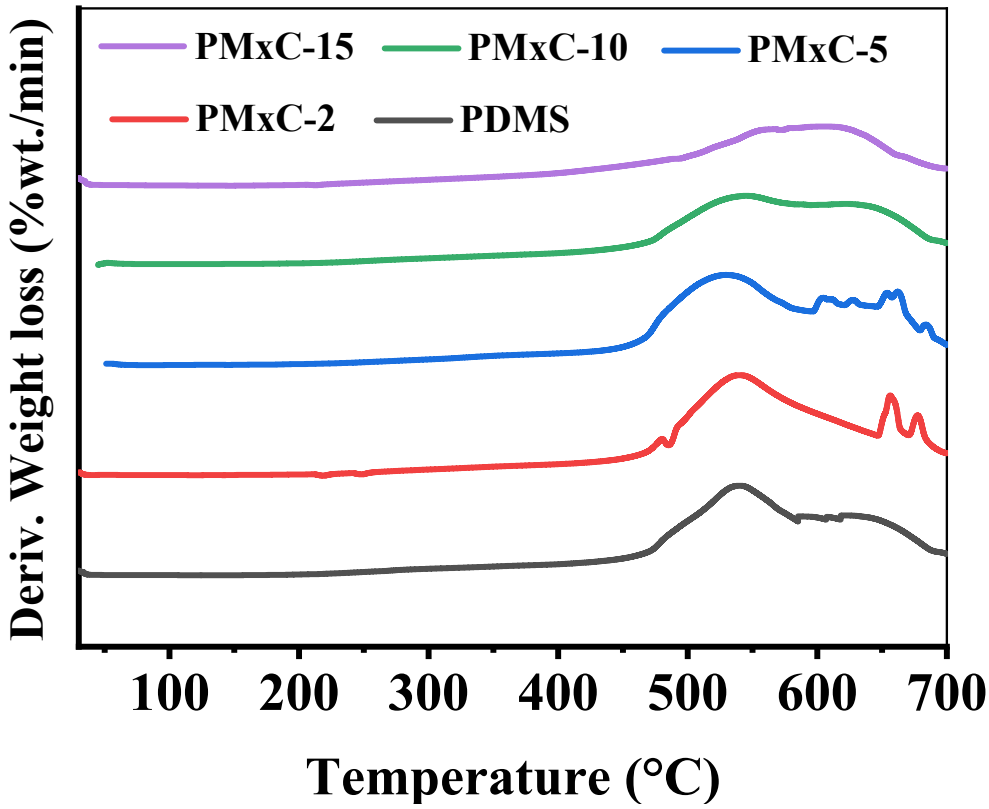


Figure S10: DTG characterization of composite membranes.