Electronic Supplementary Information for

Proton Conducting Electrospun Sulfonated Polyether Ether Ketone-Graphene Oxide Composite Membranes

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Table S1. Young's modulus, maximum tensile strength, maximum strain and tenacity results from tensile microtests for pure $SPEEK_{65}$–PVA_{35} membrane, SPEEK/PVA@GO membrane and SPEEK/PVA@GO-NF membranes with different nanofiber thickness.

Sample	Membrane thickness (μm)	Young's modulus E (GPa)	Maximum tensile strength σ_{max} (MPa)	Maximum strain ε_{max}	Toughness ($MJ \cdot m^{-3}$)
SPEEK–PVA	170 ±8	2.7 ± 0.5	66.9 ± 3.9	0.2 ± 0.1	12.2 ± 2.4
SPEEK/PVA@GO	190 ± 7	1.6 ± 0.4	68.9 ± 6.0	0.09 ± 0.01	2.8 ± 0.9
SPEEK/PVA@GO-NF-10	210 ± 11	1.4 ± 0.2	23.8 ± 4.3	0.021 ± 0.001	0.2 ± 0.1
SPEEK/PVA@GO-NF-20	200 ± 9	1.5 ± 0.2	30.2 ± 5.7	0.022 ± 0.001	0.4 ± 0.2
SPEEK/PVA@GO-NF-30	220 ± 10	1.6 ± 0.3	36.8 ± 4.1	0.024 ± 0.004	0.4 ± 0.2
SPEEK/PVA@GO-NF-50	187 ± 7	2.1 ± 0.4	43.5 ± 5.9	0.03 ± 0.01	0.8 ± 0.3

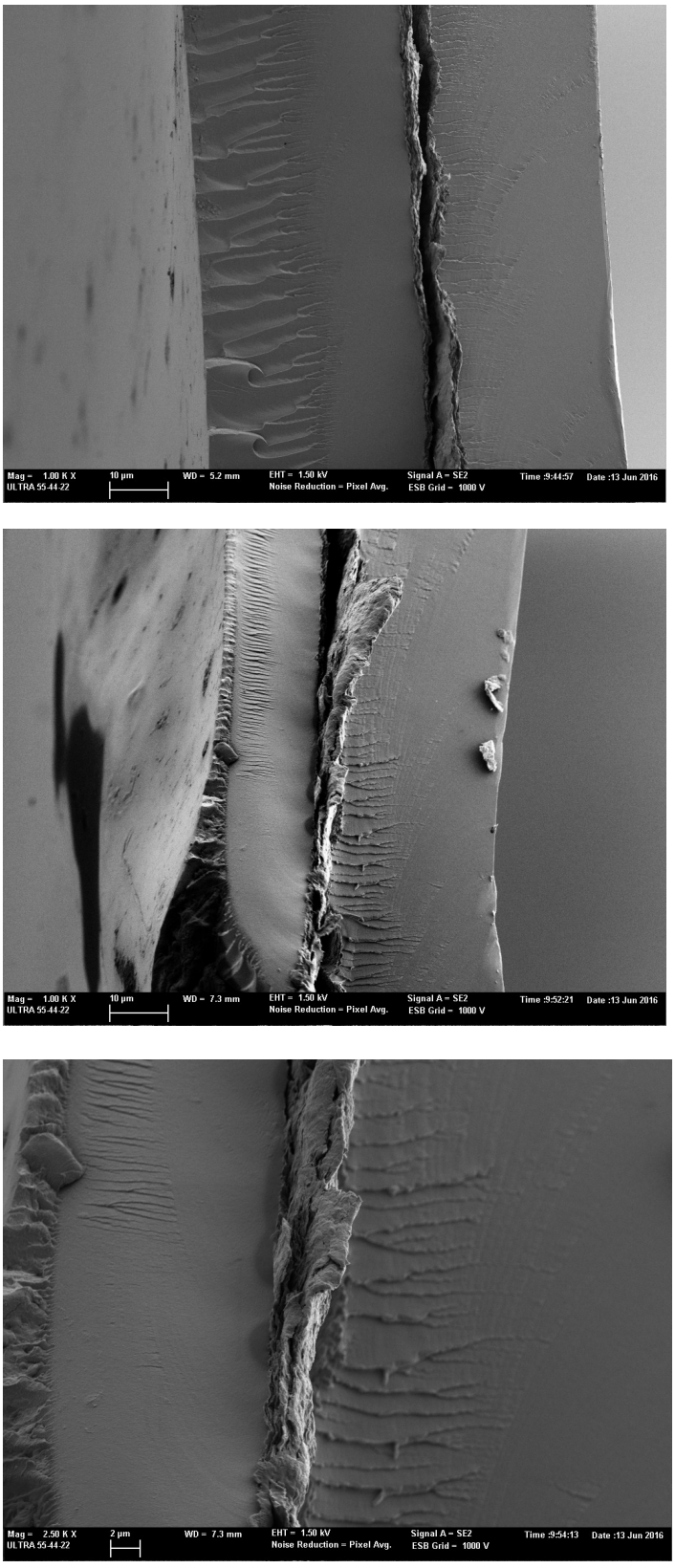

Figure S1. SEM images of SPEEK/PVA@GO composite membrane.

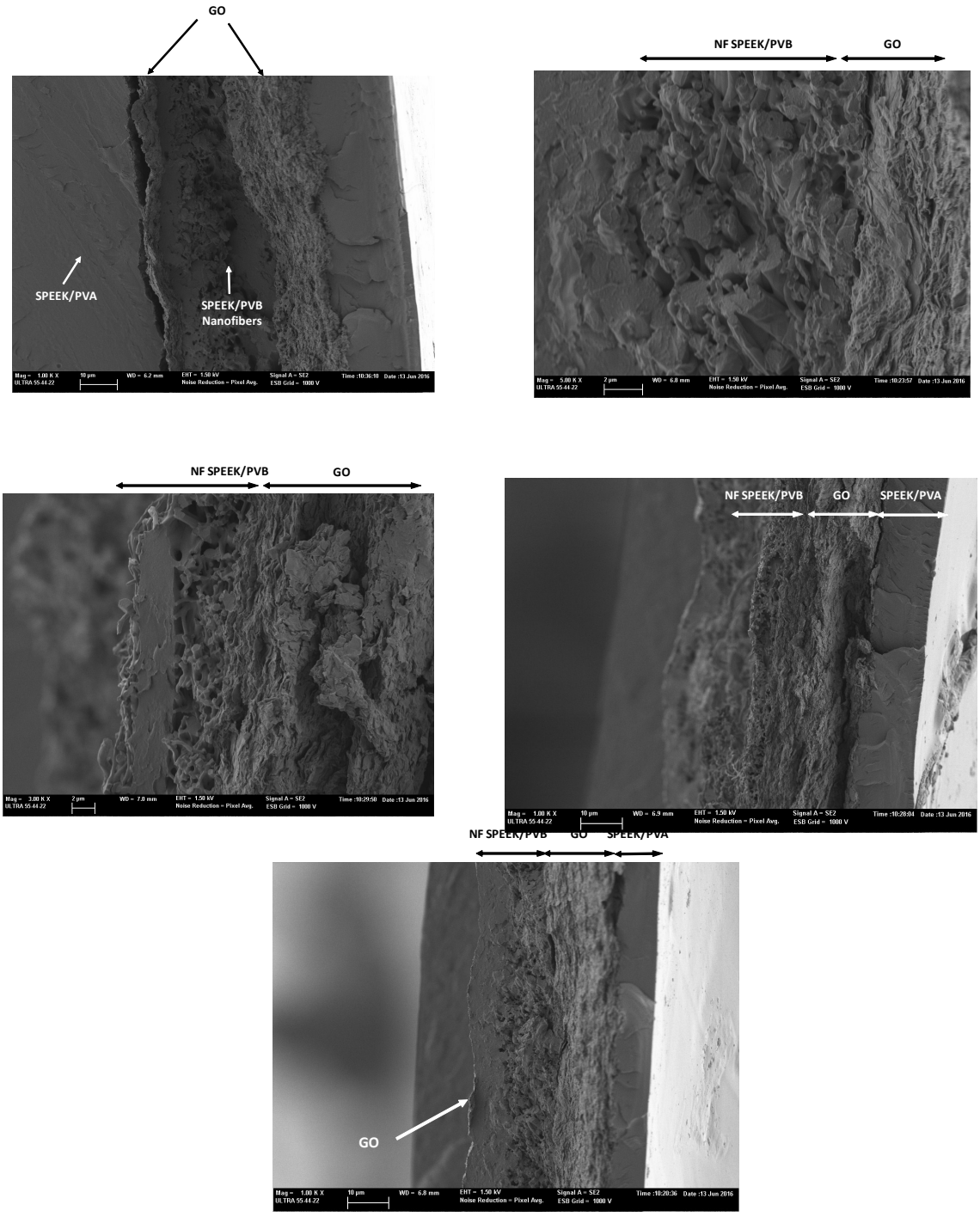

Figure S2. SEM images of SPEEK/PVA@GO-NF-50 composite membrane.

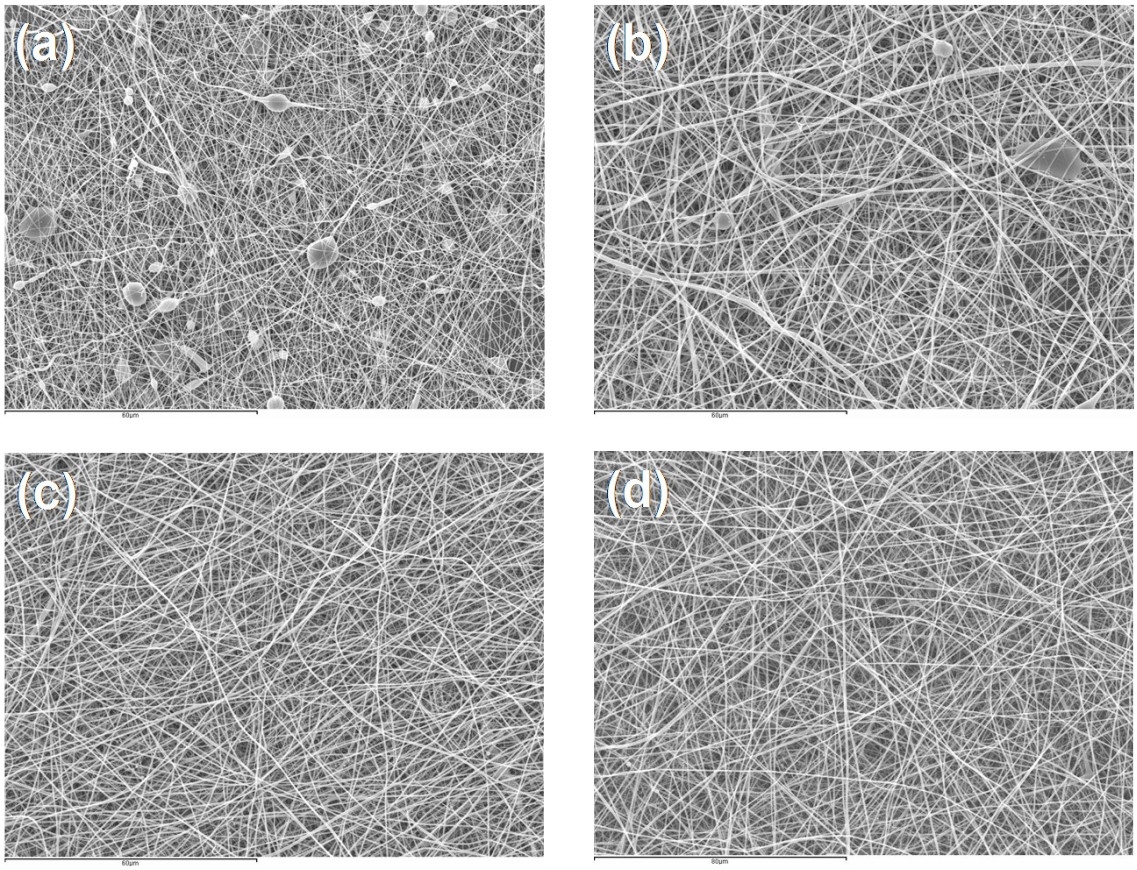

Figure S3. SEM images of electrospun SPEEK/PVB nanofibers.

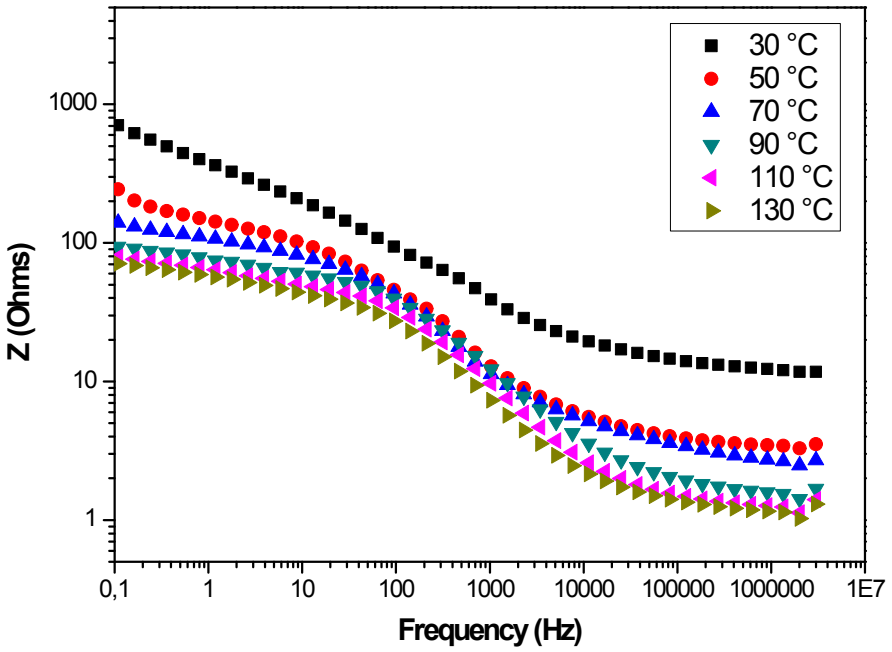

Figure S4. Double logarithmic plot of the impedance versus the frequency for the SPEEK/PVA@GO composite membranes in the range of temperatures compressed between 30 and 130 °C.

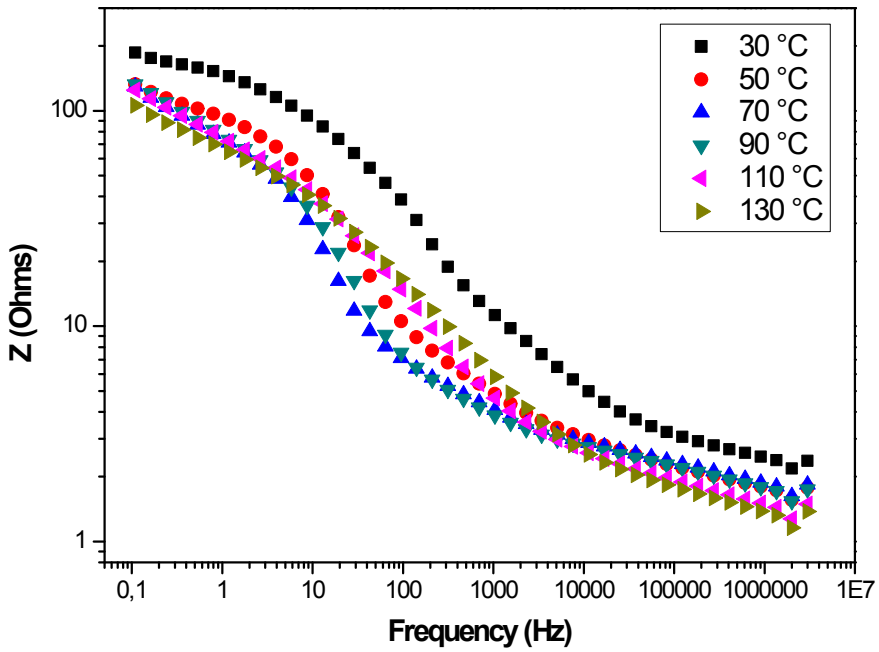

Figure S5. Double logarithmic plot of the impedance versus the frequency for the SPEEK/PVA@GO-NF composite membrane with fibers of 10 μm thickness in the range of temperatures compressed between 30 and 130 °C.

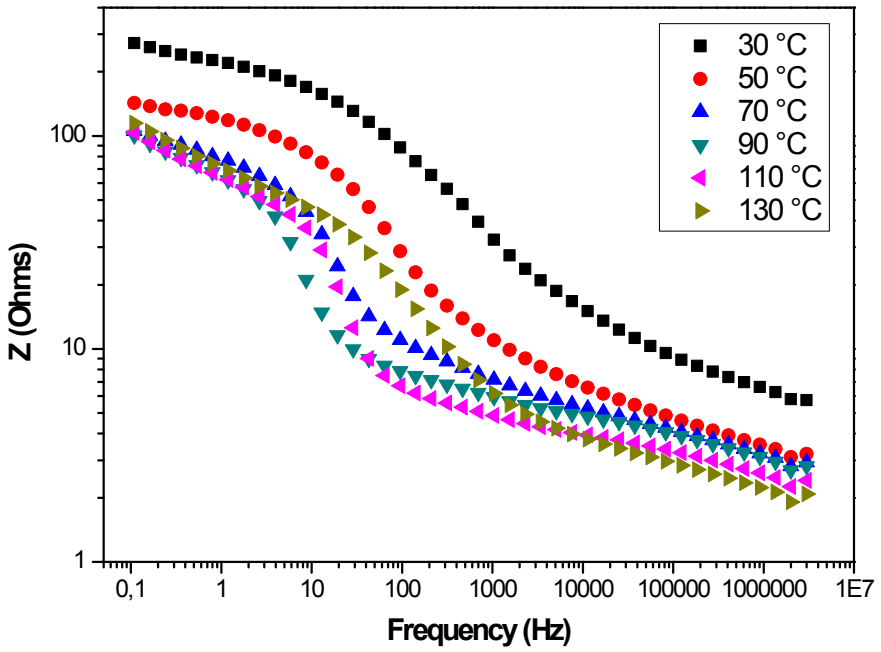

Figure S6. Double logarithmic plot of the impedance versus the frequency for the SPEEK/PVA@GO-NF composite membrane with fibers of 30 μm thickness in the range of temperatures compressed between 30 and 130 °C.

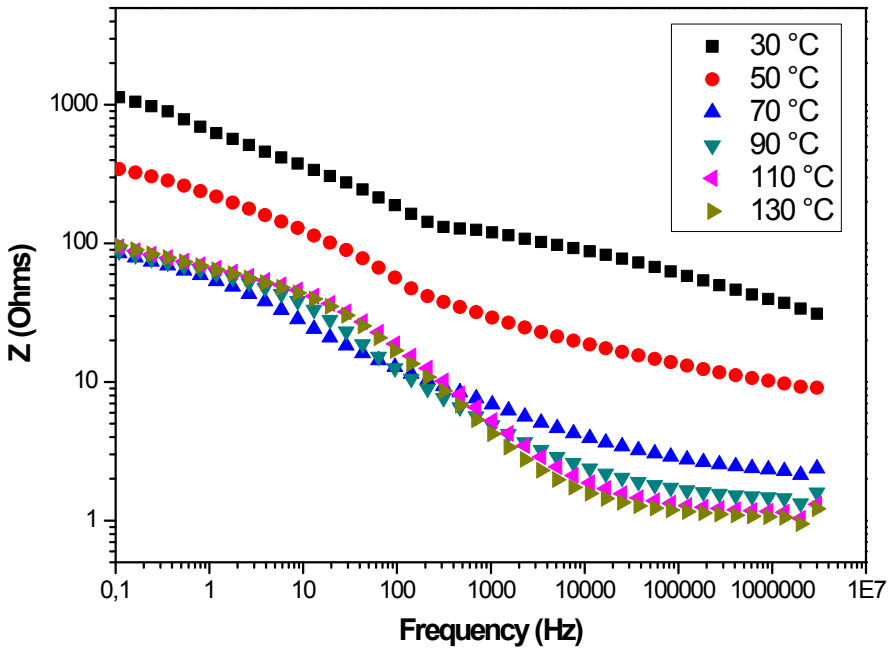

Figure S7. Double logarithmic plot of the impedance versus the frequency for the SPEEK/PVA@GO-NF composite membrane with fibers of 50 μm thickness in the range of temperatures compressed between 30 and 130 °C.

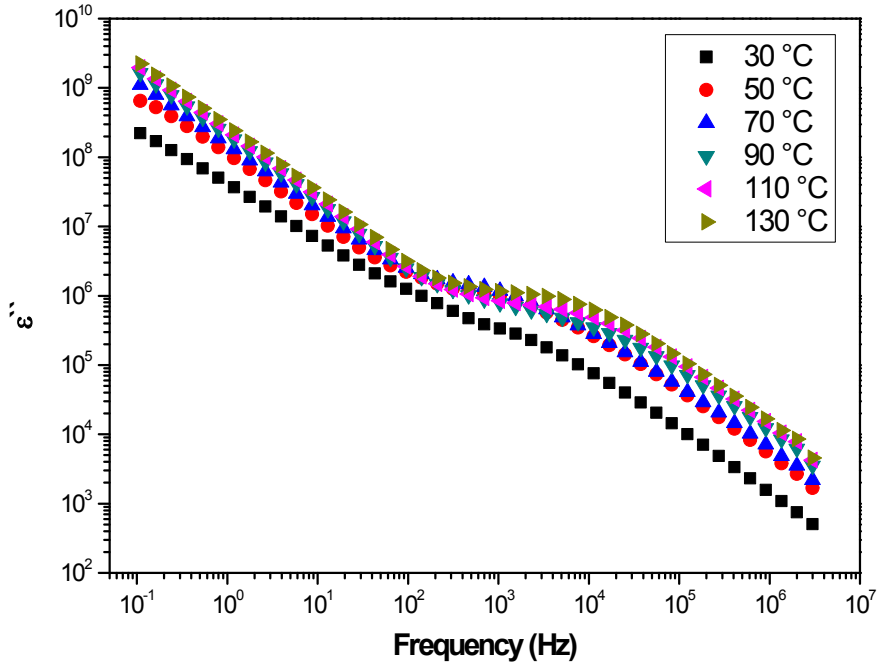

Figure S8. Double logarithmic plot of the imaginary permittivity ε´´ versus the frequency for the SPEEK/PVA@GO composite membrane in the range of temperatures compressed between 30 and 130 °C.

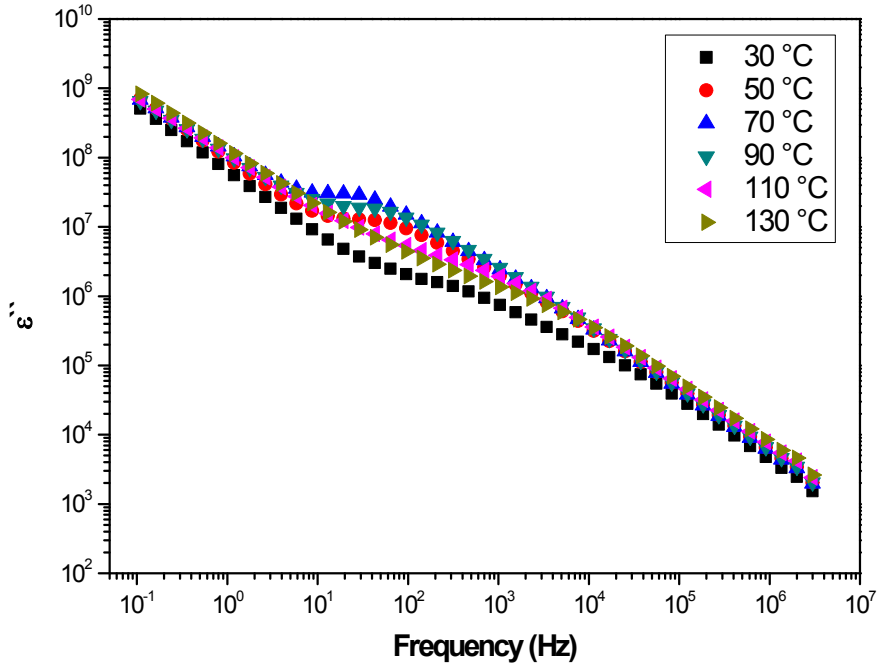

Figure S9. Double logarithmic plot of the imaginary permittivity ε´´ versus the frequency for the SPEEK/PVA@GO-NF composite membrane with fibers of 50 μm thickness in the range of temperatures compressed between 30 and 130 °C.

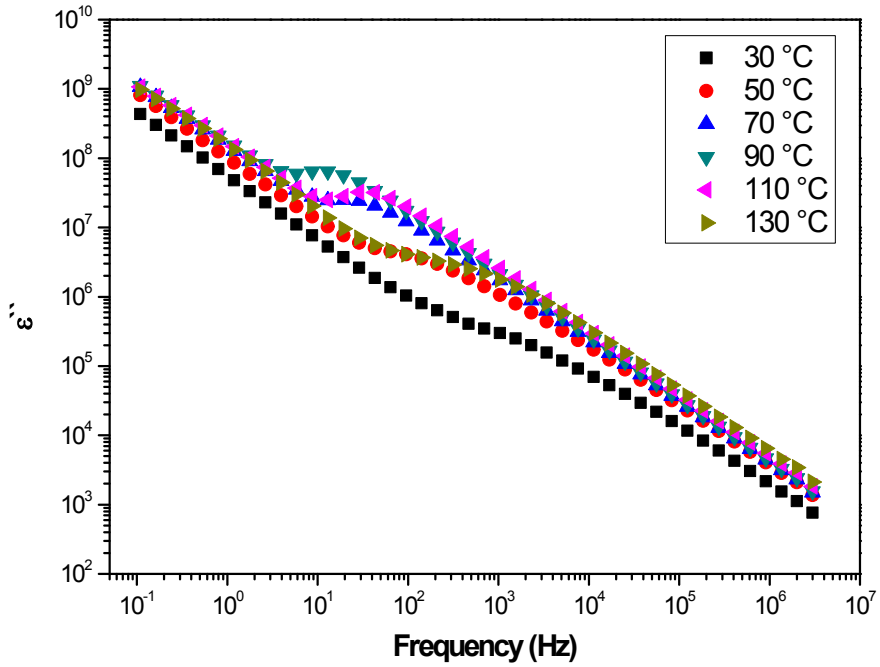

Figure S10. Double logarithmic plot of the imaginary permittivity ε´´ versus the frequency for the SPEEK/PVA@GO-NF composite membrane with fibers of 50 μm thickness in the range of temperatures compressed between 30 and 130 °C.

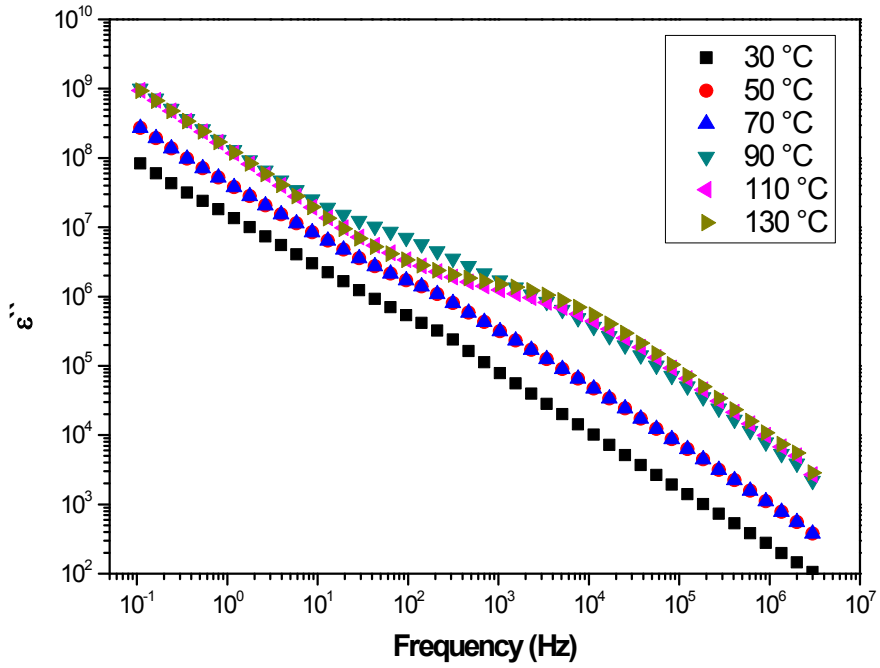

Figure S11. Double logarithmic plot of the imaginary permittivity ε´´ versus the frequency for the SPEEK/PVA@GO-NF composite membrane with fibers of 50 μm thickness in the range of temperatures compressed between 30 and 130 °C.

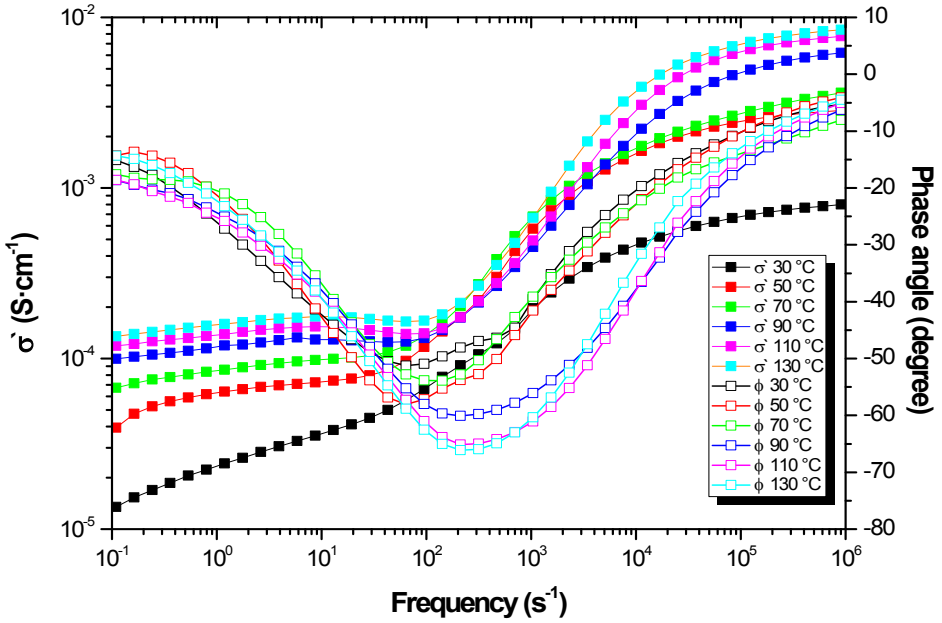

Figure S12. Bode diagram for the SPEEK/PVA@GO composite membrane in the range of temperatures compressed between 30 and 130 °C.

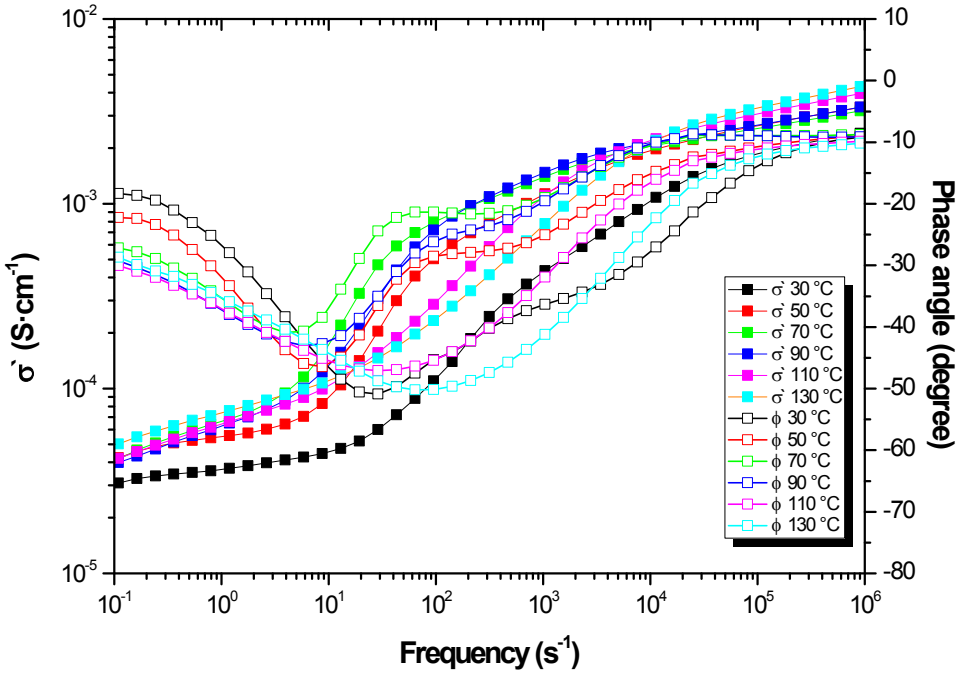

Figure S13. Bode diagram for the SPEEK/PVA@GO-NF composite membrane with fibers of 10 μm thickness in the range of temperatures compressed between 30 and 130 °C.

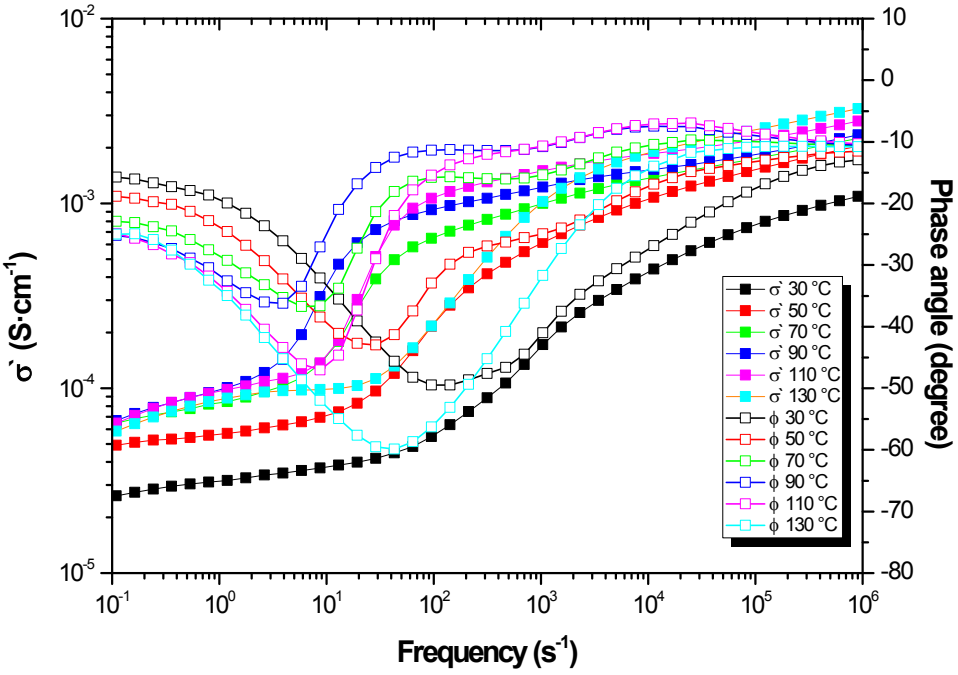

Figure S14. Bode diagram for the SPEEK/PVA@GO-NF composite membrane with fibers of 30 μm thickness in the range of temperatures compressed between 30 and 130 °C.

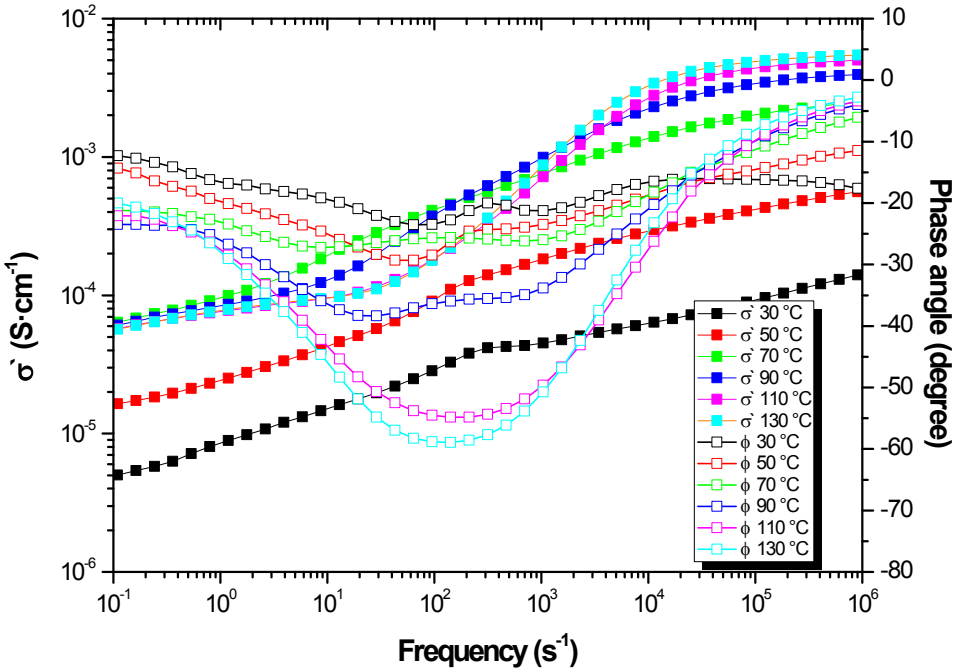

Figure S15. Bode diagram for the SPEEK/PVA@GO-NF composite membrane with fibers of 50 μm thickness in the range of temperatures compressed between 30 and 130 °C.

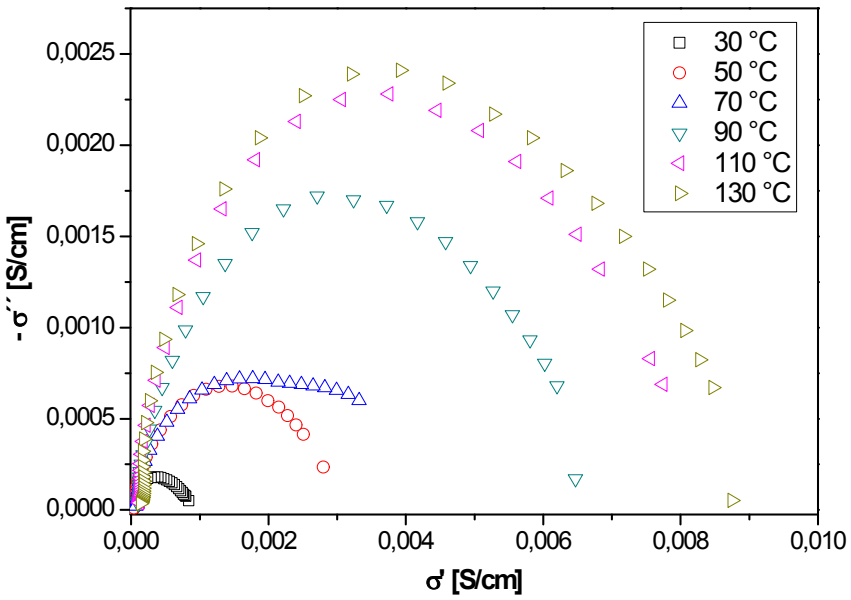

Figure S16. Nyquist diagram (σ´vs. – σ´´) for the SPEEK/PVA@GO composite membrane in the range of temperatures compressed between 30 and 130 °C.

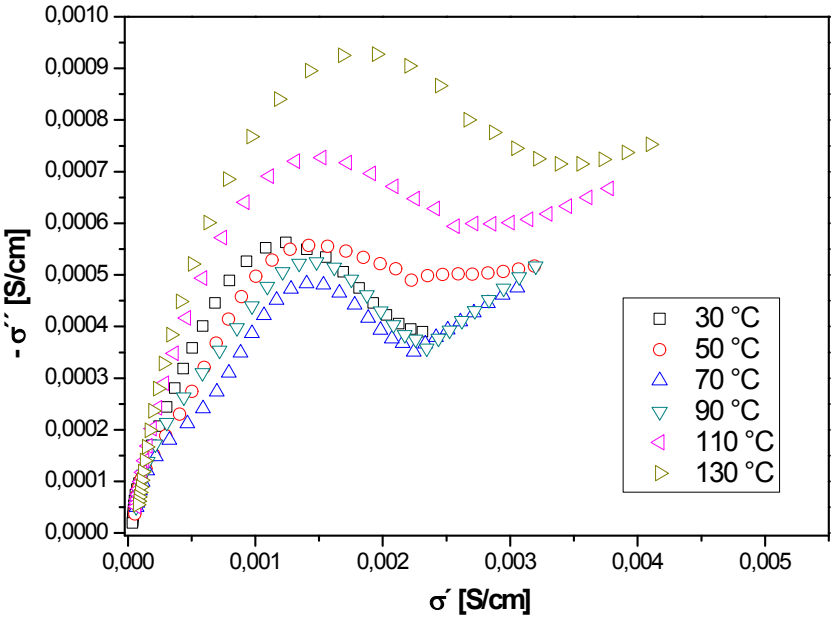

Figure S17. Nyquist diagram (σ´vs. – σ´´) for the SPEEK/PVA@GO-NF composite membrane with fibers of 10 μm thickness in the range of temperatures compressed between 70 and 130 °C.

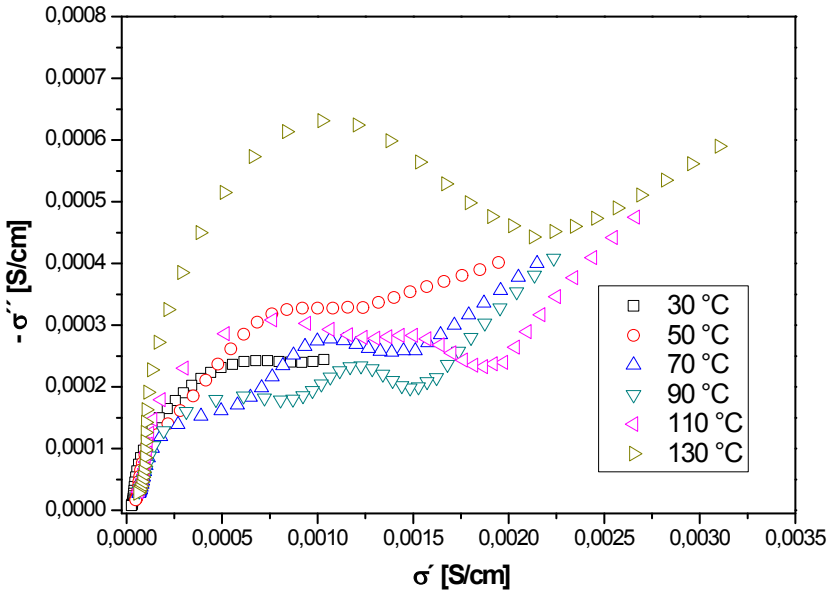

Figure S18. Nyquist diagram (σ´vs. – σ´´) for the SPEEK/PVA@GO-NF composite membrane with fibers of 30 μm thickness in the range of temperatures compressed between 70 and 130 °C.

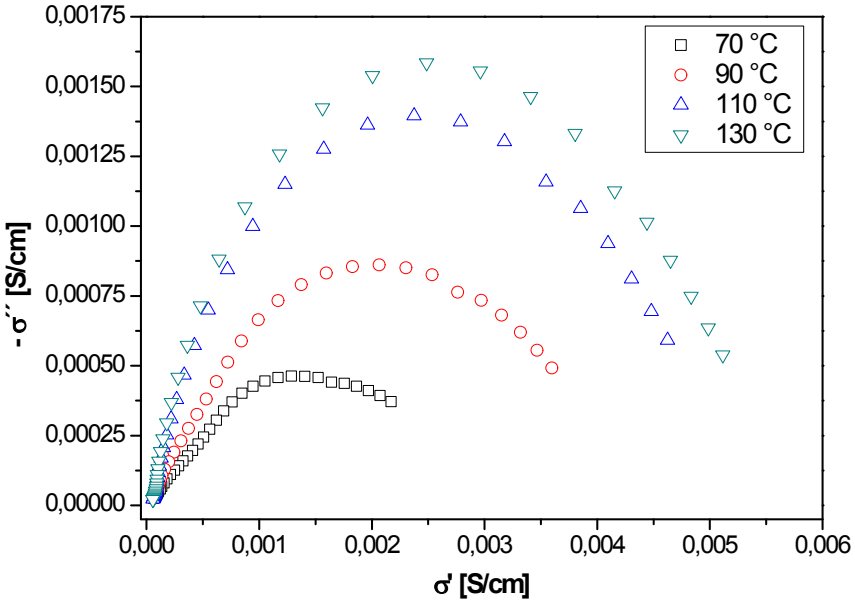

Figure S19. Nyquist diagram (σ´vs. – σ´´) for the SPEEK/PVA@GO-NF composite membrane with fibers of 50 μm thickness in the range of temperatures compressed between 70 and 130 °C.