

Formulating PEO-Polycarbonate Blends As Solid Polymer Electrolytes By Solvent-Free Extrusion

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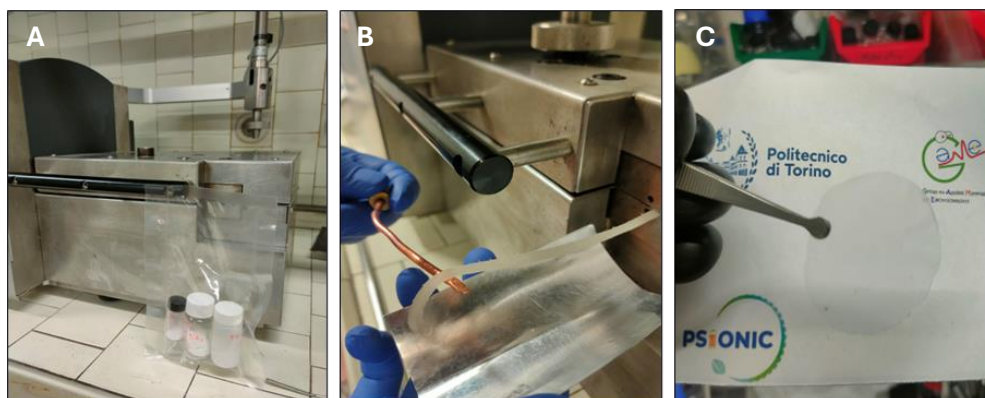


Figure S1. Different steps of the extrusion process. The starting materials (A) were introduced into the extruder. After 15 minutes of mixing at 140°C and 130 rpm, the blend was extracted from the extruder (B). The formulation was then hot-pressed to obtain the final self-standing membrane (C).

Table S1. Set of Experiments for DoE with the composition of the membranes produced and the three results taken into account.

| Exp Name | PC | PEO | %PEO | Voltage (V) | Conductivity (S/cm) | Crystallinity (%) |
|----------|-----|------|------|-------------|---------------------|-------------------|
| N1 | PEC | 400k | 0 | 4.13 | 3.22e-09 | 0 |
| N2 | PEC | 400k | 30 | 4.66 | 9.42e-06 | 0 |
| N3 | PEC | 400k | 70 | 4.51 | 3.4e-05 | 30.7 |
| N4 | PEC | 400k | 100 | 4.48 | 3.15e-05 | 37.0 |
| N5 | PEC | 4M | 0 | 4.13 | 5e-10 | 0 |
| N6 | PEC | 4M | 30 | 4.66 | 7.42e-06 | 3.0 |
| N7 | PEC | 4M | 70 | 4.51 | 1.43e-05 | 22.7 |
| N8 | PEC | 4M | 100 | 4.64 | 4.57e-05 | 35.9 |
| N9 | PPC | 400k | 0 | 4.42 | 5e-10 | 0 |
| N10 | PPC | 400k | 30 | 4.53 | 5.89e-06 | 0 |
| N11 | PPC | 400k | 70 | 4.54 | 3.4e-05 | 30.9 |
| N12 | PPC | 400k | 100 | 4.48 | 2.13e-05 | 29.0 |
| N13 | PPC | 4M | 0 | 4.42 | 8.19e-10 | 0 |
| N14 | PPC | 4M | 30 | 4.50 | 1.8e-06 | 0 |
| N15 | PPC | 4M | 70 | 4.65 | 2.98e-05 | 31.7 |
| N16 | PPC | 4M | 100 | 4.64 | 2.06e-05 | 33.4 |
| N17 | PEC | 400k | 70 | 4.63 | 2.83e-05 | 17.9 |
| N18 | PEC | 4M | 30 | 4.65 | 5.31e-06 | 0 |
| N19 | PPC | 400k | 30 | 4.38 | 1.28e-06 | 0 |
| N20 | PPC | 4M | 70 | 4.54 | 2.49e-05 | 21.6 |
| N21 | PEC | 400k | 50 | 4.66 | 4.58e-05 | 15.6 |
| N22 | PEC | 4M | 50 | 4.66 | 2.39e-05 | 1.31 |
| N23 | PPC | 400k | 50 | 4.66 | 1.36e-05 | 21.6 |
| N24 | PPC | 4M | 50 | 4.69 | 9.36e-06 | 18.6 |

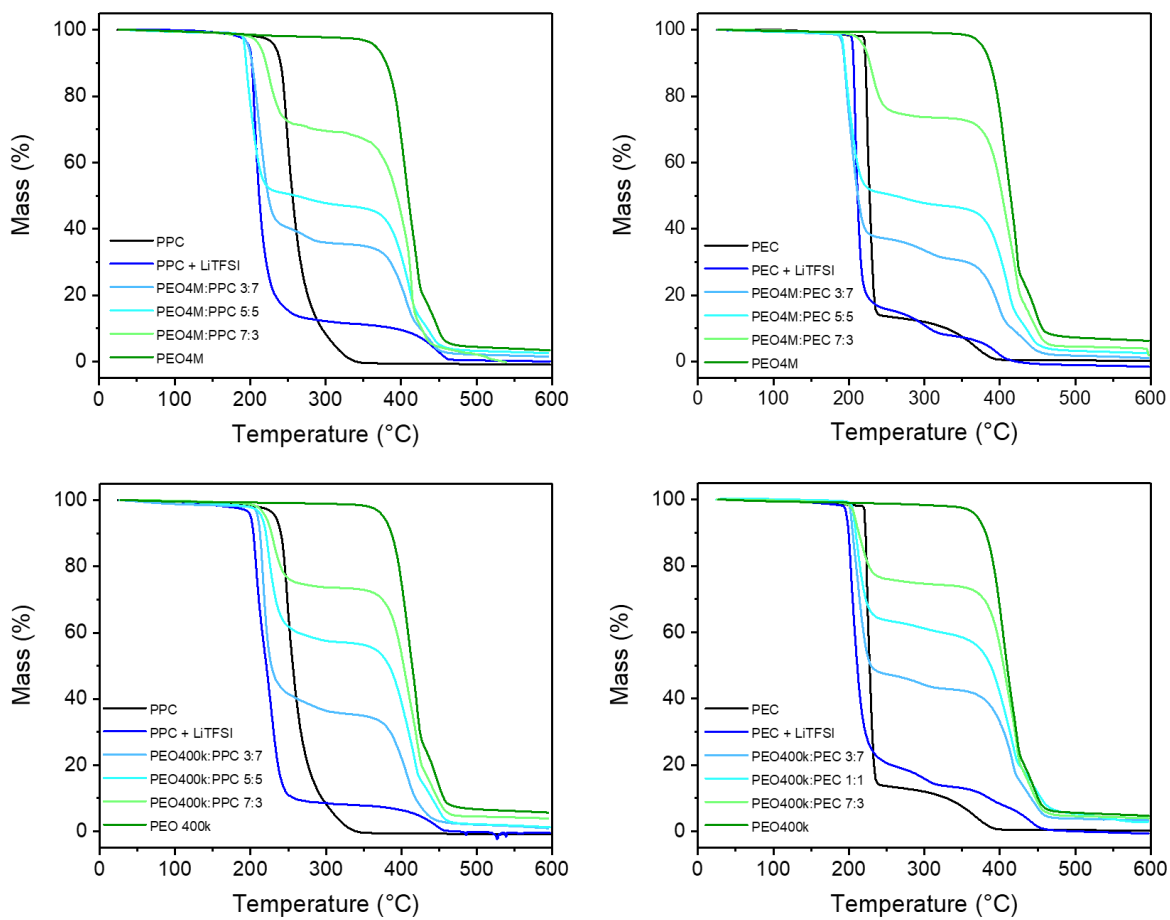


Figure S2. TGA thermograms of the samples under N₂ from 0 °C to 600 °C.

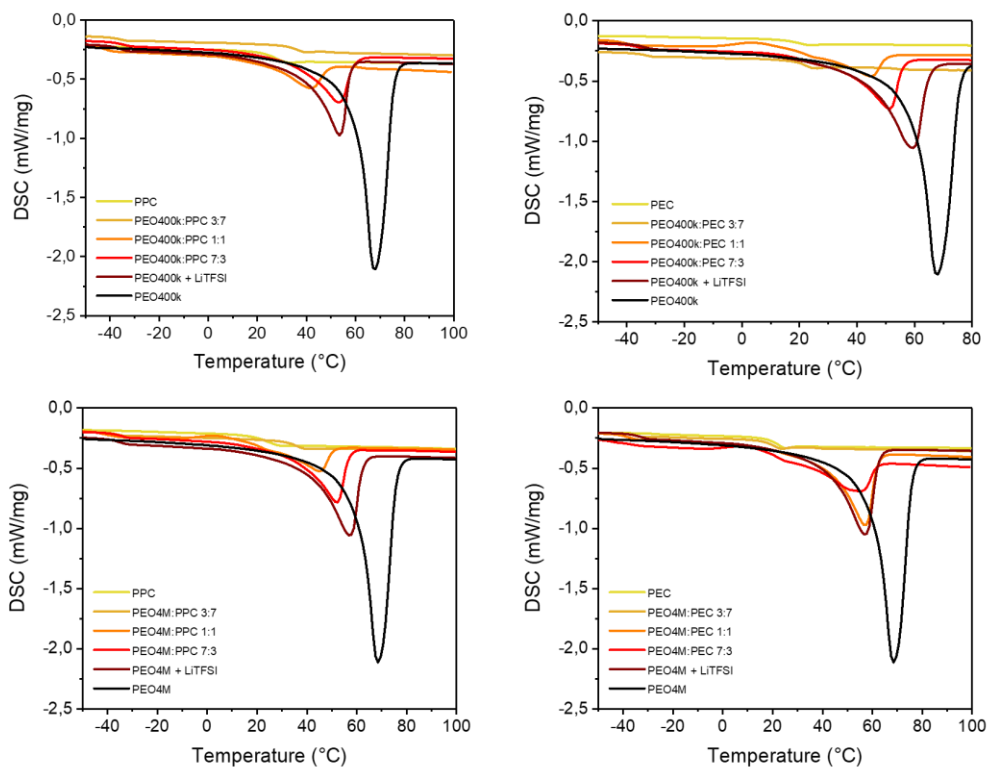


Figure S3. DSC thermograms under N₂ from -50 °C to 100 °C with a heating rate of 10 °C min⁻¹.

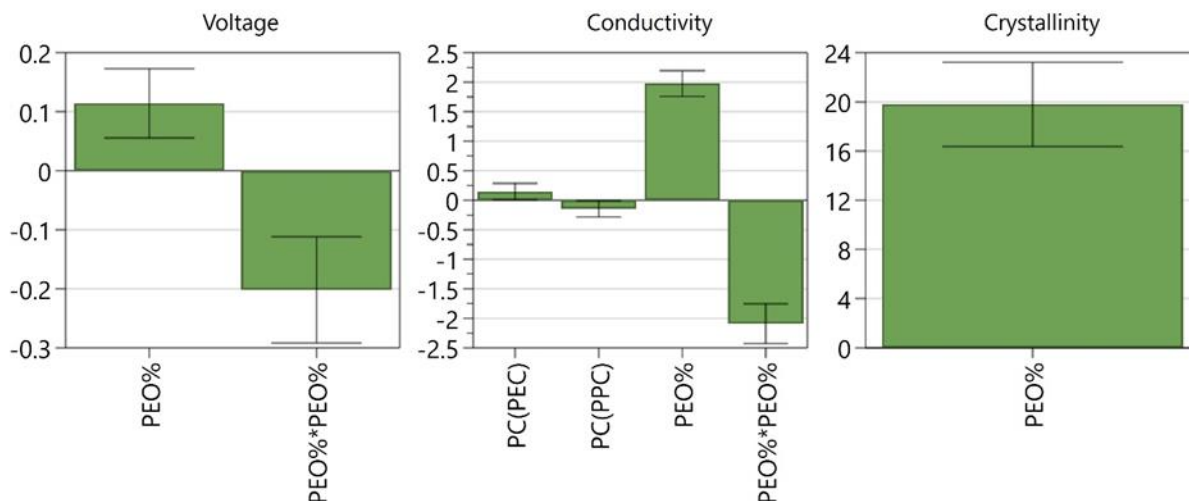


Figure S4. Scaled and centered regression coefficients plot for voltage, crystallinity, and conductivity models. Model equations for i) voltage (mV) $y = 4.62 + 0.11 * \%PEO - 0.20 * \%PEO * \%PEO$, ($R^2=0.56$); ii) conductivity ($S\ cm^{-1}$). $\log(y) = -4.67 + 1.94 * \%PEO - 2.04 * \%PEO * \%PEO + 0.15 * PC(PEC) - 0.15 * PC(PPC)$, ($R^2=0.95$); iii) crystallinity (%) $y = 14.62 + 19.79 * \%PEO$, ($R^2=0.82$).

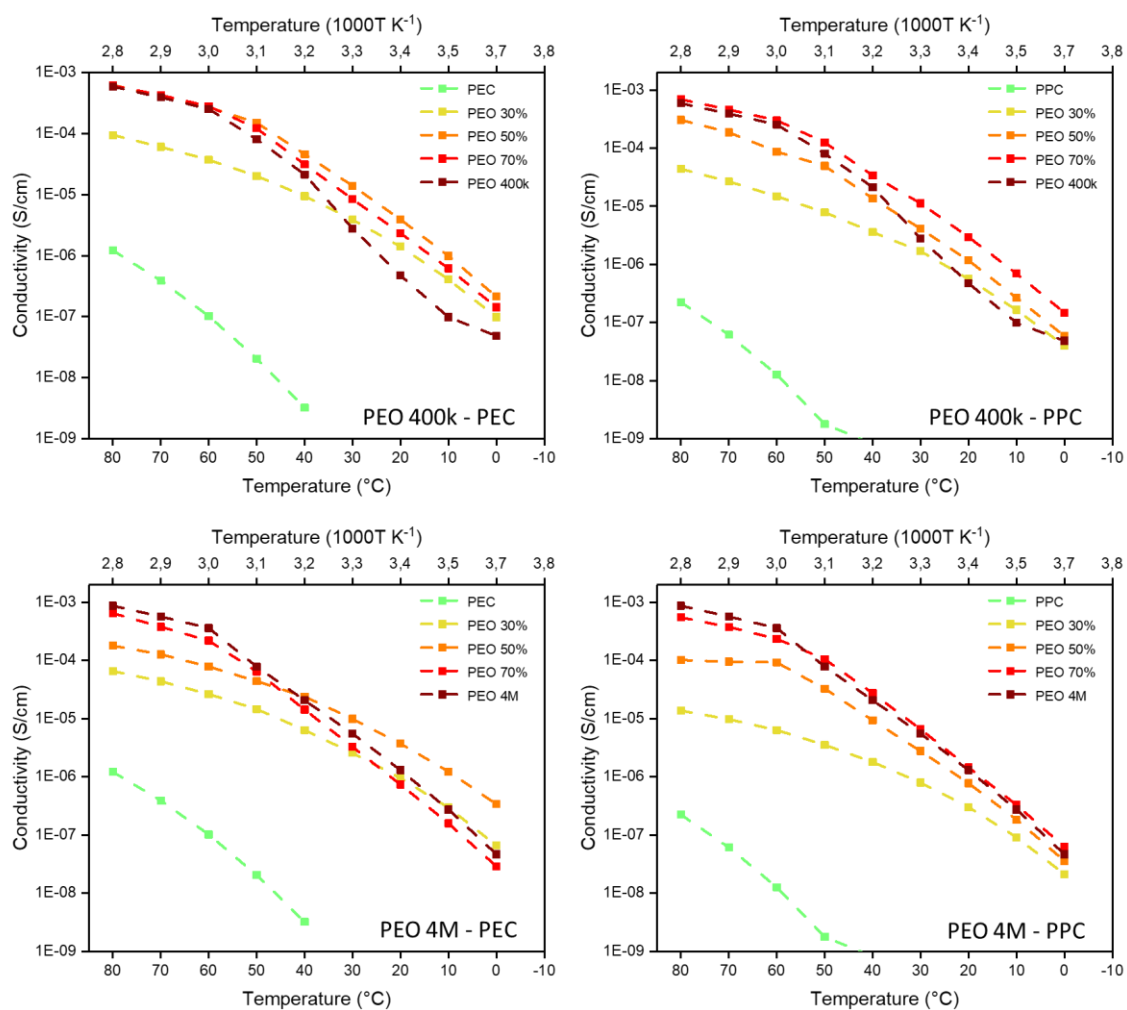


Figure S5. Arrhenius plots of ionic conductivities versus temperatures determined by EIS in the range of 0 – 80 °C for blended polymers.