

The impact of recovered lignin on solid-state PEO-based electrolyte produced by electrospinning: manufacturing and characterization

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In accordance with extant literature, the optimisation of the formulation was pursued through the experimental testing of varying concentrations of PEO and solvents [1–3]. The composition of tested formulation is reported in Table S1 and morphology is showed in Figure S1.

Table S1. Composition of tested formulations

	PEO concentration	Ratio Lignin:PEO	Ratio LiTFSI:PEO	Solvent
A-B	5%(w/v)	-	-	Acetonitrile
C-D	20% (w/v)	1:9	1:10	DMSO:Acetone (70:30)

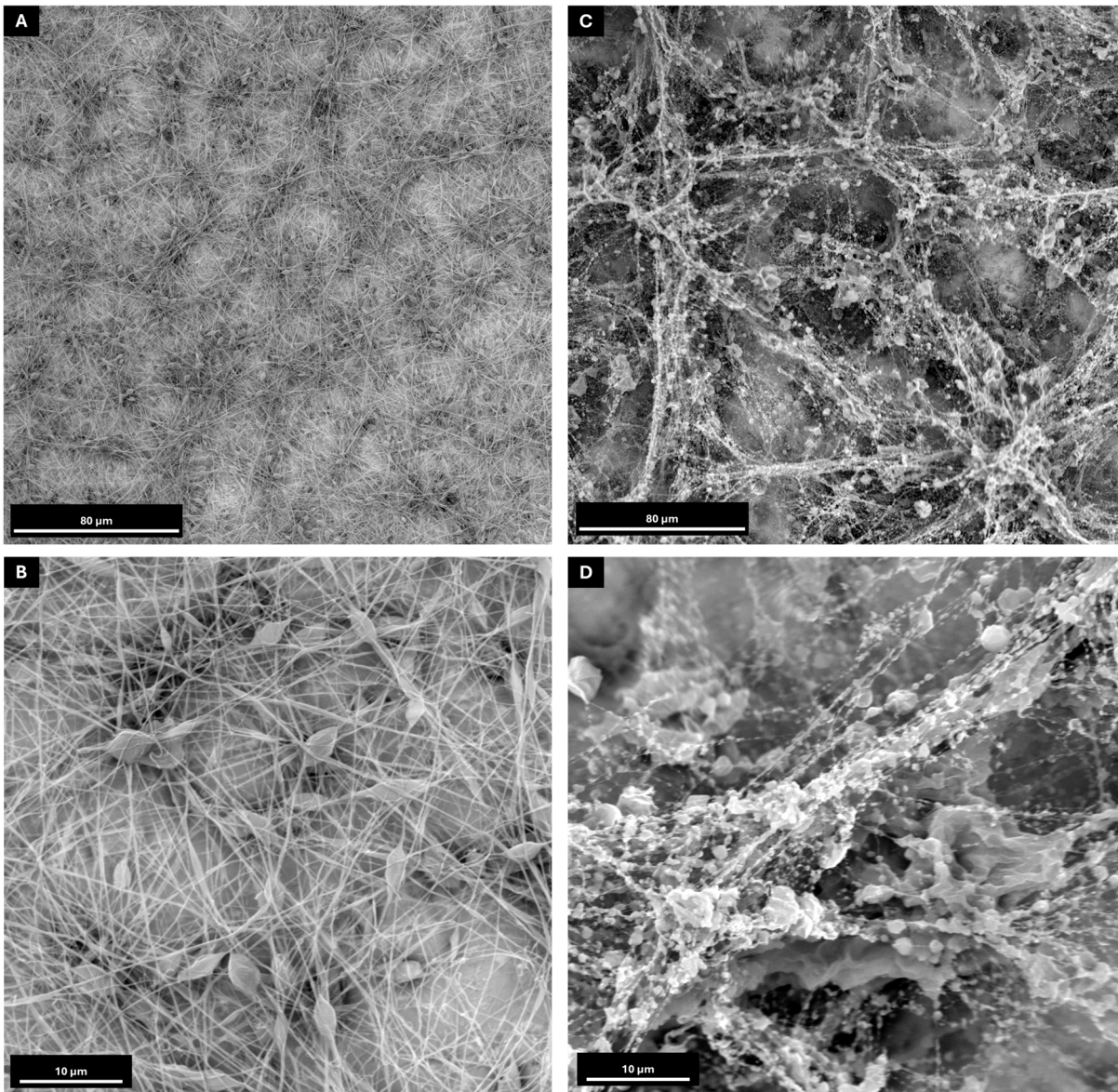


Figure S1. SEM images at 1000X and 5000X magnifications: A-B) 5% w/v PEO in Acetonitrile; C-D) PEO-Lignin-LiTFSI in DMSO : Acetone.

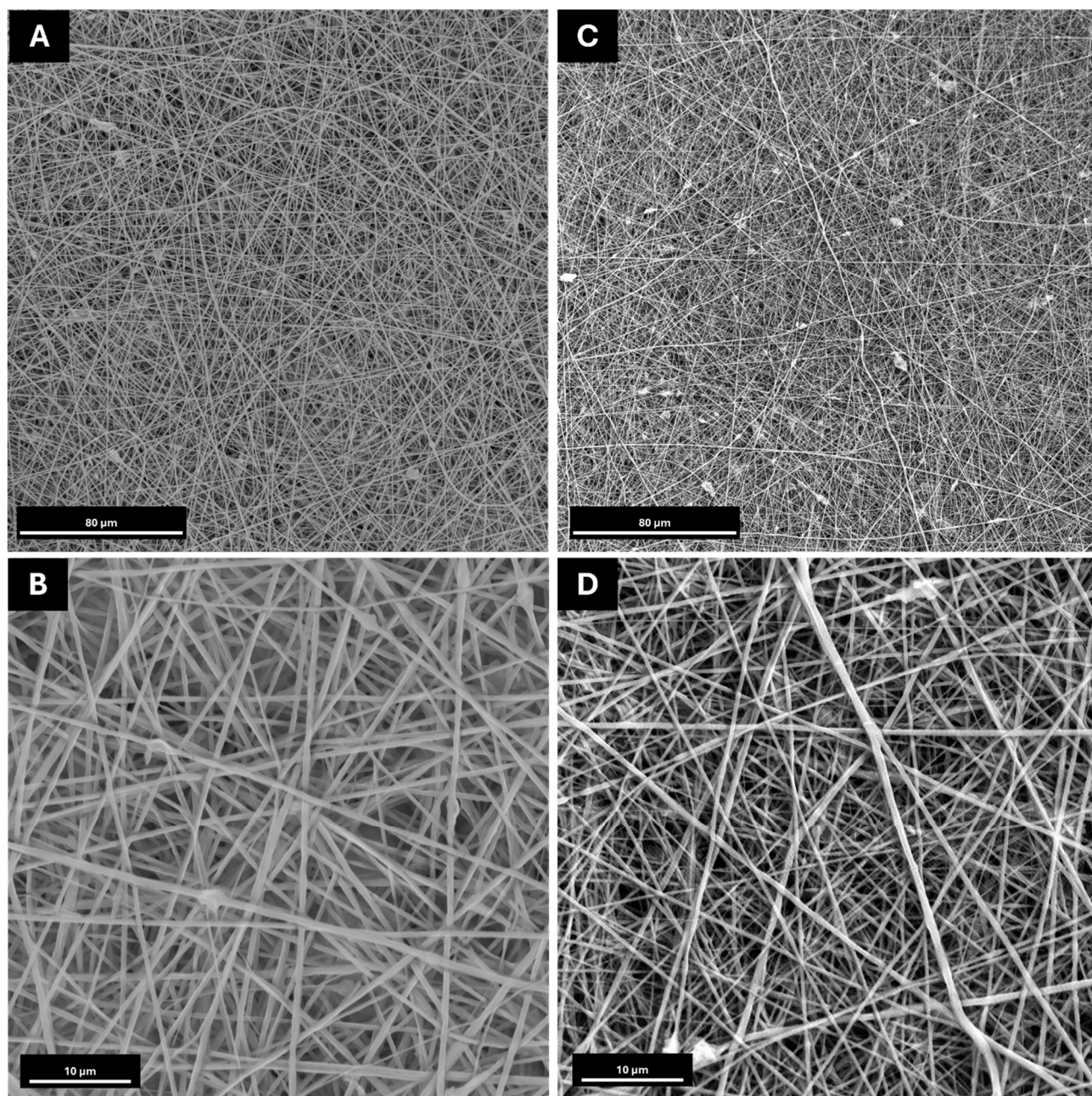


Figure S2. SEM images at 1000X and 5000X magnifications: A-B) PEO; C-D) PEO-Lignin.

Table S2. Average size of diameters determined using ImageJ software

	Average diameter (nm)
PEO	490 ± 200
PEO-Lignin	440 ± 230
PEO-LiTFSI	350 ± 130
PEO-Lignin-LiTFSI	330 ± 120

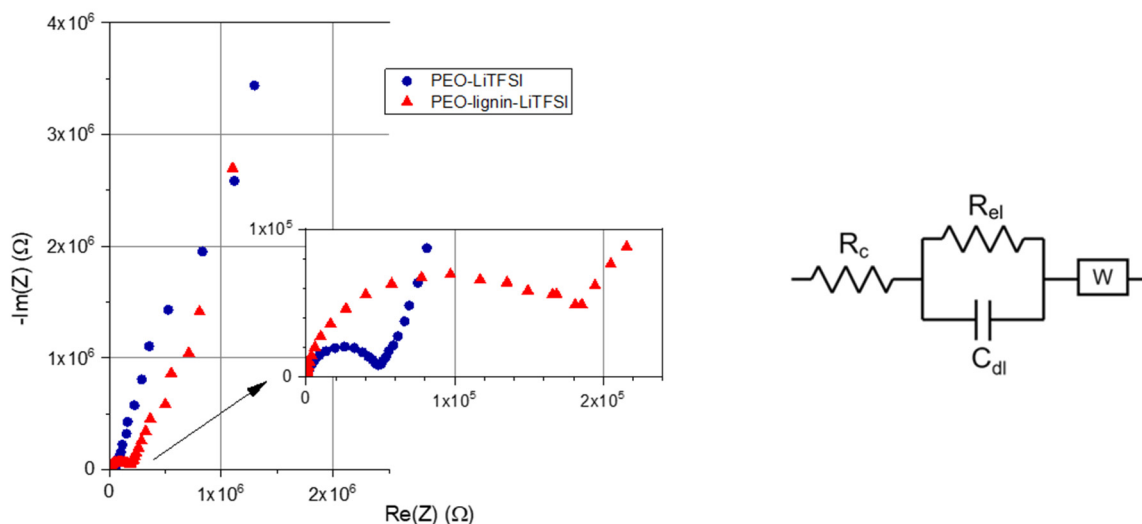


Figure S3. EIS spectra of PEO-LiTFSI and PEO-lignin-LiTFSI solid polymer electrolyte membranes in symmetric cells with stainless-steel blocking electrodes at 15 °C. The equivalent circuit used to fit the spectra is shown, where R_{el} is the resistance value used to calculate the conductivity reported in Figure 6.

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2. Banitaba, S.N.; Semnani, D.; Karimi, M.; Heydari-Soureshjani, E.; Rezaei, B.; Ensafi, A.A. A Comparative Analysis on the Morphology and Electrochemical Performances of Solution-Casted and Electrospun PEO-Based Electrolytes: The Effect of Fiber Diameter and Surface Density. *Electrochimica Acta* 2021, 368, 137339, doi:10.1016/j.electacta.2020.137339.
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