# SUPPLEMENTARY INFORMATION

## Reinforced PEI/PVdF multicore-shell structure composite membranes by phase prediction on a ternary solution

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Keywords: Electrospinning, multicore-shell, polymer blend, membrane, Flory-Huggins theory

**Table S1.** Properties of PEI and PVdF obtained from manufacturer

| Properties | PEI | PVdF |
|---|---|---|
| Tensile strength (MPa) | 85 | - |
| Tensile modulus (GPa) | 3.6 | - |
| Vicat softening point ($^{o}$C) | 219 | - |
| Glass transition temperature ($^{o}$C) | 217 | -35 |
| Melting temperature ($^{o}$C) | 350 | 165 |
| Density (g/cm$^{3}$) | 1.27 | 1.77 |

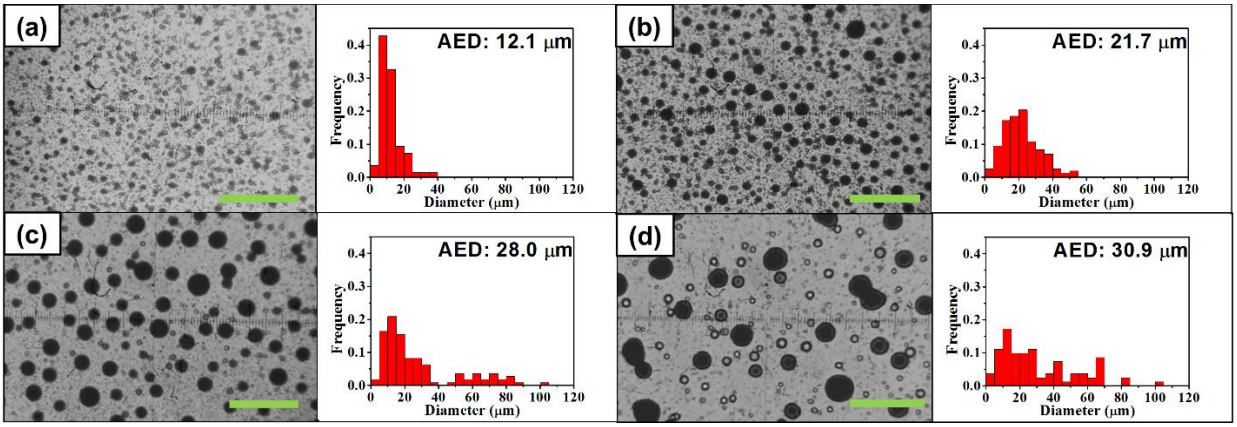


**Figure S1.** Optical microscope (OM) images and PEI droplet size distribution of PEI/PVdF (1:2 wt. ratio) blend solution after a waiting time of (a) 10 min, (b) 20 min, (c) 30 min, and (d) 40 min without stirring. The green scale bars are 100 μm.

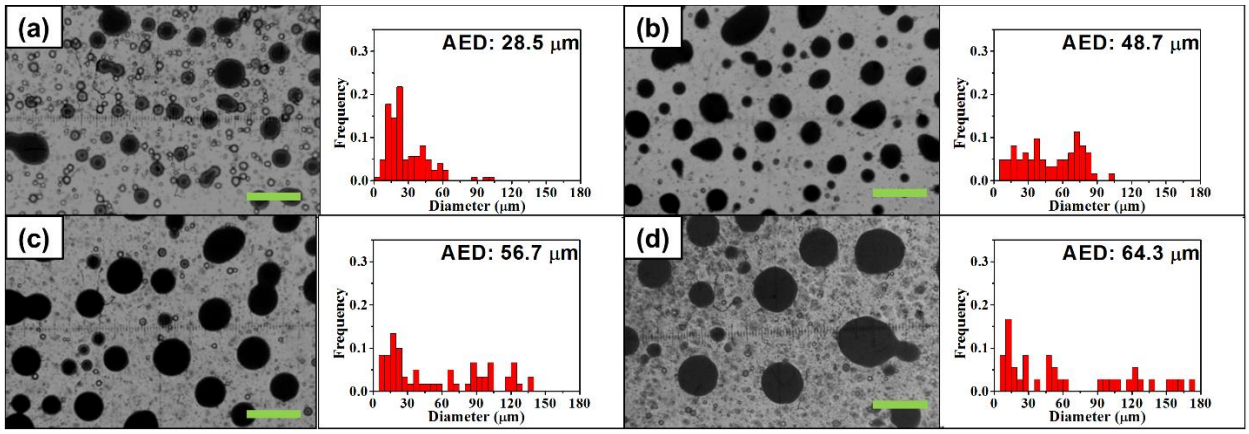


**Figure S2.** OM images and PEI droplet size distribution of PEI/PVdF (2:1 wt. ratio) blend solution after a waiting time of (a) 10 min, (b) 20 min, (c) 30 min, (d) 40 min without stirring. The green scale bars are 100 μm.

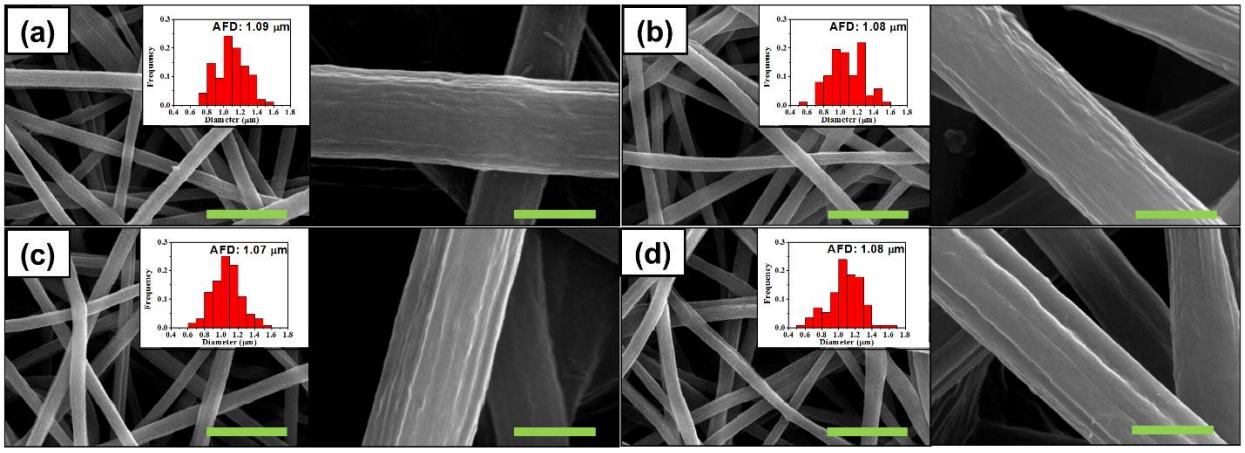


**Figure S3.** SEM images and diameter distributions of electrospun PEI/PVdF (1:2 wt. ratio) fibers collected after the interval of (a) 10 min, (b) 20min, (c) 30 min, and (d) 40 min. Images on the right are enlarged for morphology observation. The green scale bars are 6 μm and 1 μm accordingly. The frequencies in insets were normalized by the number of counted samples.

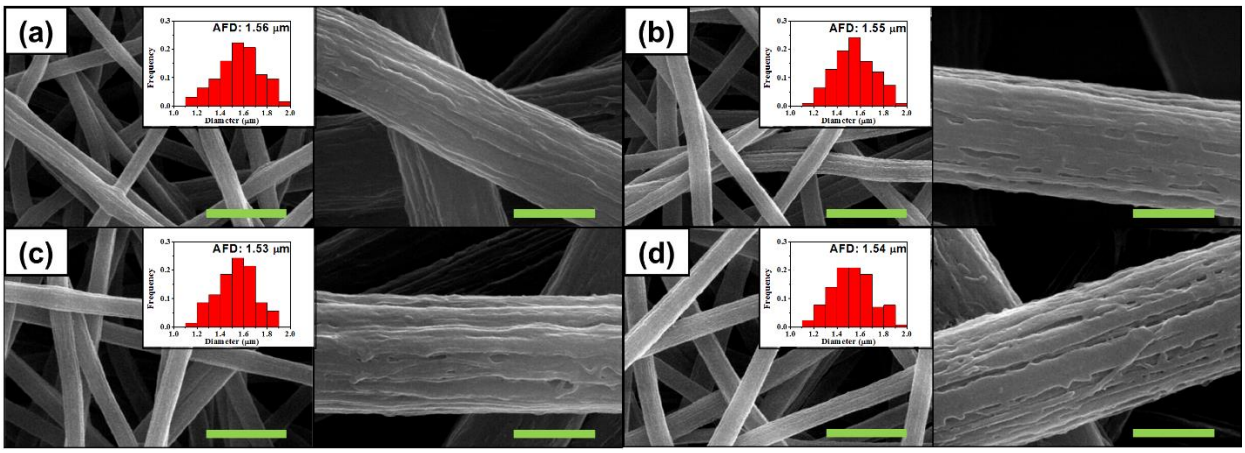


**Figure S4.** SEM images and diameter distributions of electrospun PEI/PVdF (2:1 wt. ratio) fibers collected after the interval of (a) 10 min, (b) 20min, (c) 30 min, and (d) 40 min. Images on the right are enlarged for morphology observation. The green scale bars are 6 μm and 1 μm accordingly. The frequencies in insets were normalized by the number of counted samples.

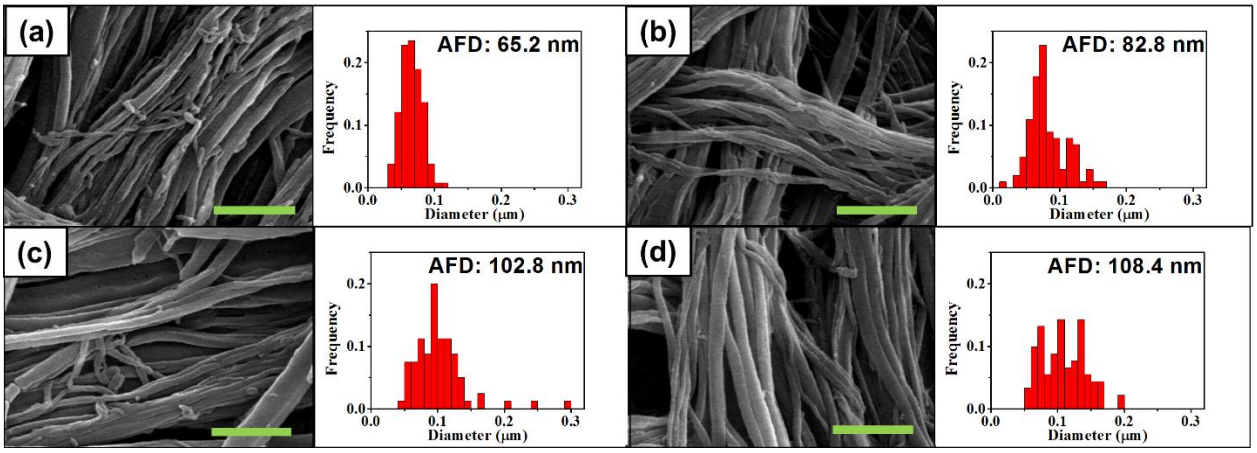


**Figure S5.** SEM images and diameter distributions of PEI fibrils after PVdF extraction using acetone from electrospun PEI/PVdF (1:2 wt. ratio) fibers collected after the interval of (a) 10 min, (b) 20min, (c) 30 min, and (d) 40 min. The green scale bars are 1 μm.

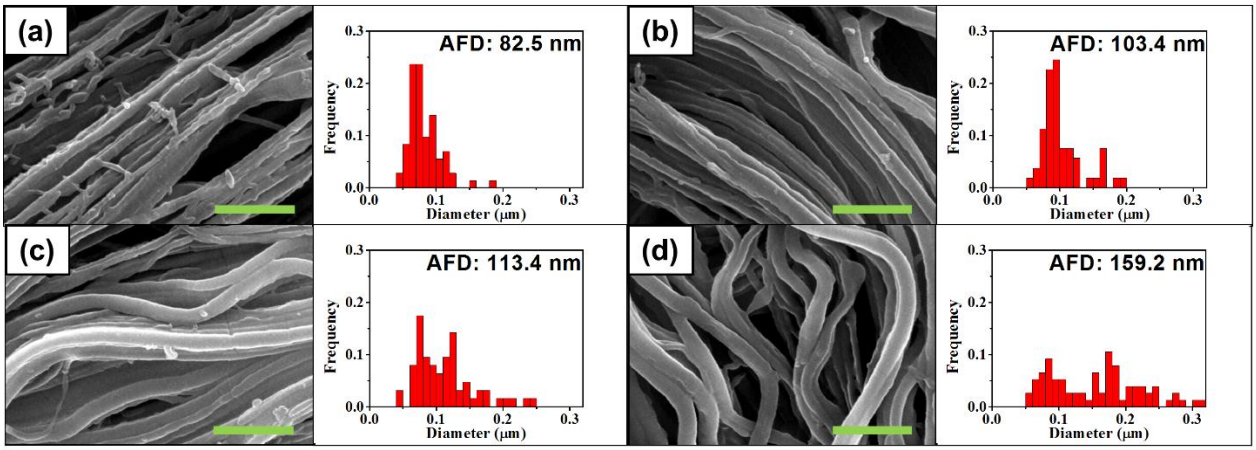


**Figure S6.** SEM images and diameter distributions of PEI fibrils after PVdF extraction using acetone from electrospun PEI/PVdF (2:1 wt. ratio) fibers collected after the interval of (a) 10 min, (b) 20min, (c) 30 min, and (d) 40 min. The green scale bars are 1 μm.

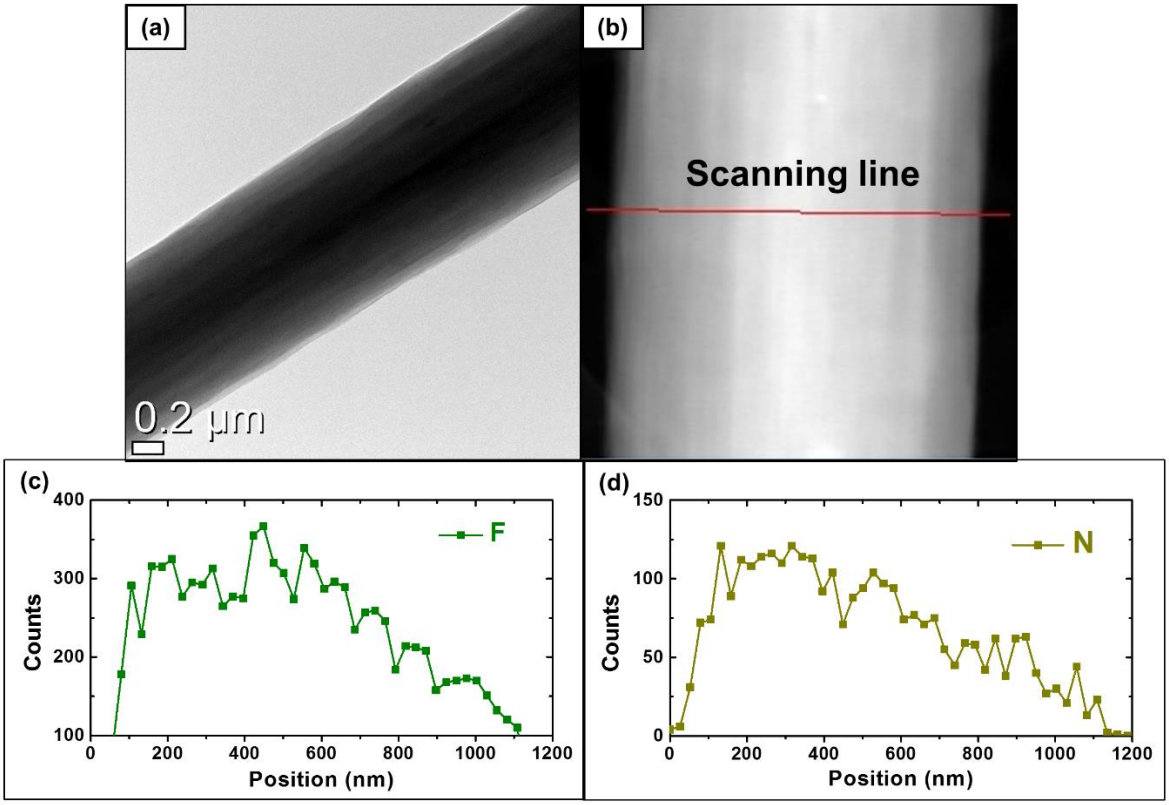


**Figure S7.** TEM images of (a) PEI/PVdF_10min (1:1 wt. ratio) and (b) EDX scanning line. (c, d) Element detection of fluorine and nitrogen along the scanning line. Fluorine and nitrogen were selected for observing the distribution of PVdF and PEI, respectively.

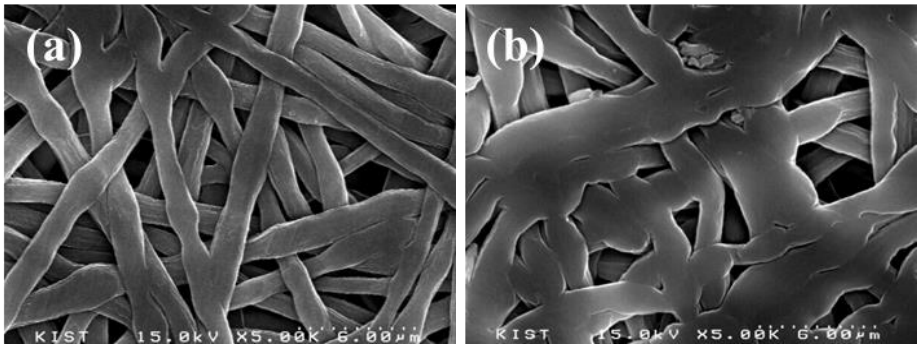


**Figure S8**. SEM images of the electrospun PEI/PVdF (1:1 wt. ratio) blend membranes after heat-pressing with (a) 1/4 and (b) 1/5 ratios

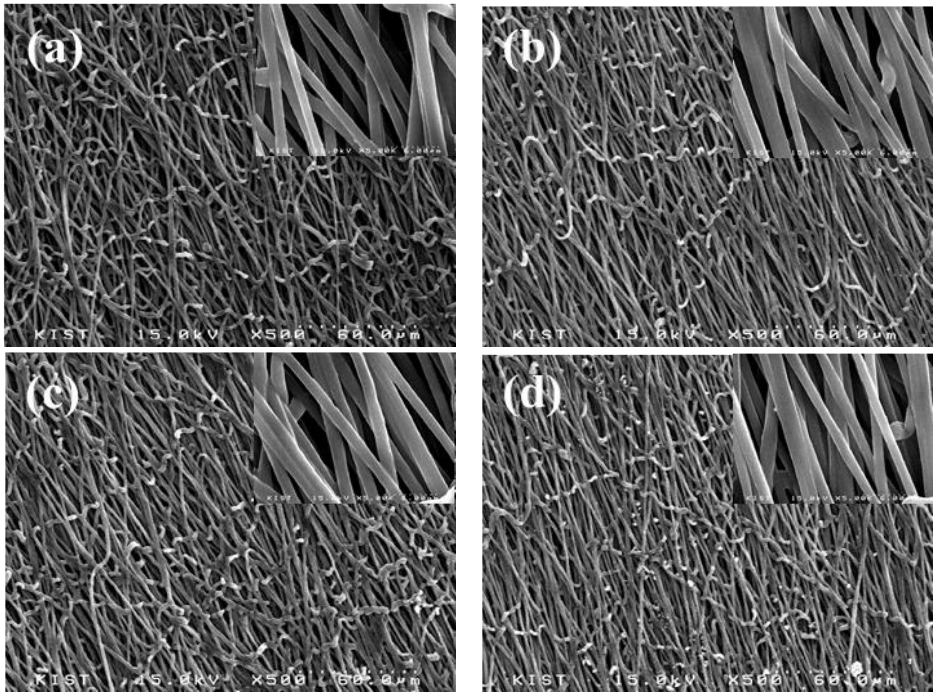


**Figure S9.** SEM images of the electrospun PEI/PVdF (1:1 wt. ratio) blend membranes (1/4 heat-pressed) after heat-stretching process followed; the stretching ratio (a) 60%, (b) 89% (c) 93% and (d) 100%