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Electronic Supplementary Information (ESI)

Fabrication and electrolyte characterization of uniaxially aligned anion conductive polymer nanofibers

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- 1. Synthetic procedure of Q-PAES (Scheme S1).
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1. Synthetic procedure of Q-PAES



Scheme S1. Synthesis of Q-PAES.

2. ¹H-NMR spectra of PAES, CM-PAES, and Q-PAES



Fig. S1. ¹H-NMR spectra of PAES, CM-PAES (Number of introduced chloromethyl groups per repeating unit =0.82), and Q-PAES

3. Relationship between the number of introduced chloromethyl groups per repeating unit and the reaction time



Fig. S2. Number of introduced chloromethyl groups per repeating unit as a function of reaction time.

4. Large scale SEM images of Q-PAES aligned nanofibers.



Fig. S3. Large scale FE-SEM images of aligned nanofibers.



5. Anion conductivity measurements of the Q-PAES membranes and nanofibers

Fig. S4. Anion conductivity measurements of PAES membranes and nanofiber. This figure was described by modifying from a figure in our previous paper (H. Kawakami *et al., RSC Adv.,* **2014**, 4, 20005-20009.)

Uniaxially aligned nanofibers were prepared between aluminum electrode (width: 10mm, distance between electrodes: 5mm). The anion conductivities of Q-PAES membranes and nanofbers were measured by an electrochemical impedance spectroscopy. Intrinsic anion conductivity (σ) of the nanofbers were determined from the following equation; $\sigma = D/(R \cdot a \cdot N)$, where R, a, N, and d are impedance value, cross-sectional area of a single nanofber, numbers of uniaxially-aligned nanofbers between the electrodes, and distance between the electrodes, respectively, by reference to the anion conductivity measurement of conventional polymer electrolyte membranes ($\sigma = d$ /($R \cdot A$), where A is conducting area calculated from thickness and width of the membrane). The values of a and N were calculated by SEM observation.

6. SEM images and average fiber diameters of aligned nanofibers prepared by applying different voltage between aluminum plates ($V_2 = 1$ kV and 3 kV)



Fig. S5. FE-SEM images of aligned nanofibers prepared by applying different V_2 (1 kV and 3 kV). Each average fiber diameter was estimated by measuring the diameters of multiple nanofibers (n = 25) in various SEM images.