

## Supplementary Information

# Hydrogel-ionic polymer blend for humidity-insensitive ion gradient driven electricity generation

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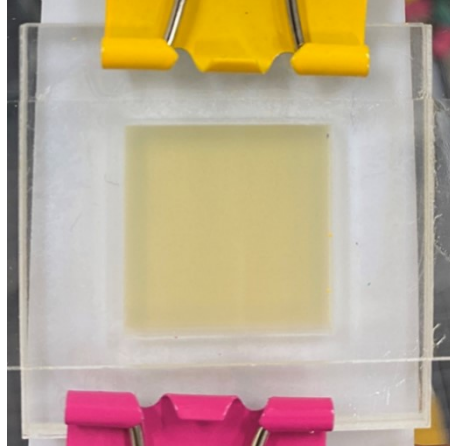
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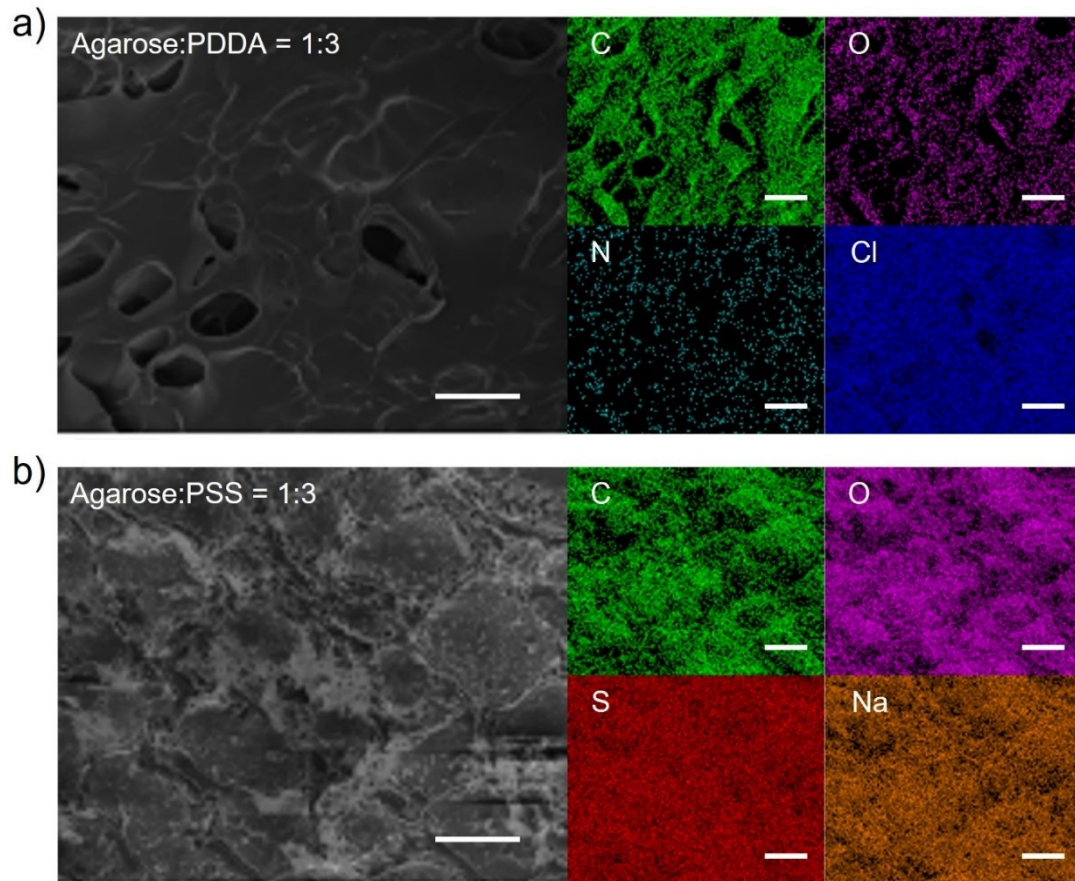
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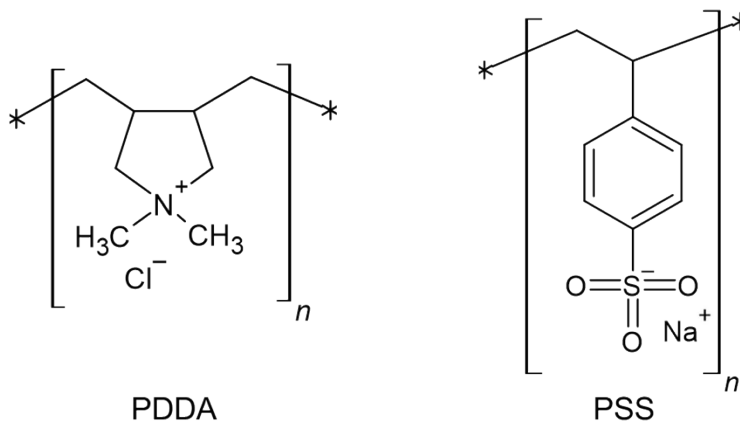
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**Figure S1.** Image of the HPEG place in a mold of the same size

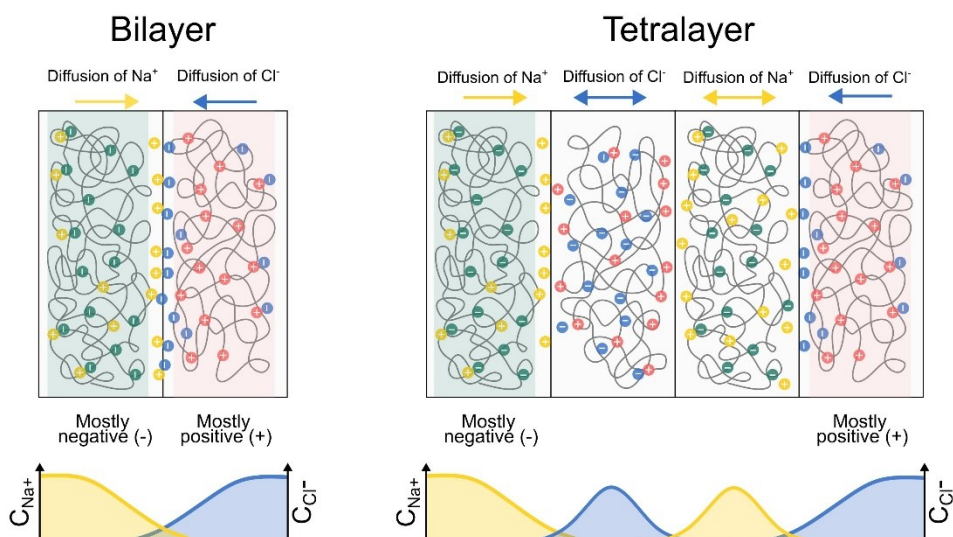


**Figure S2.** SEM and EDS images of the a) Agarose-PDDA and b) agarose-PSS sheets before contact with each other. Scale bar = 100  $\mu\text{m}$

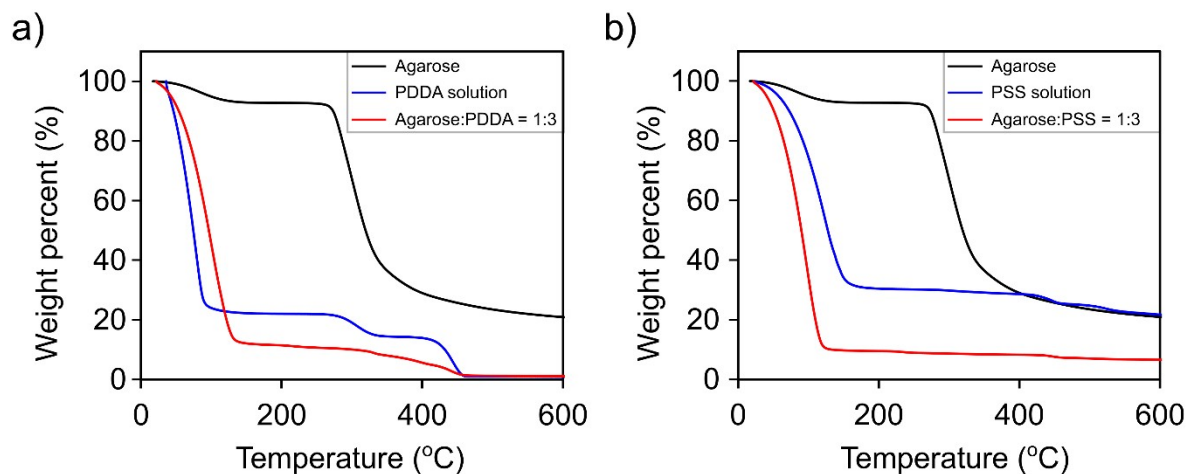


	C (12)	H (1)	N (14)	Cl (35)	O (16)	S (32)	Na (23)	Mass of repeating unit
<b>PDDA</b>	7	16	1	1	0	0	0	161
<b>PSS</b>	8	7	0	0	3	1	1	206

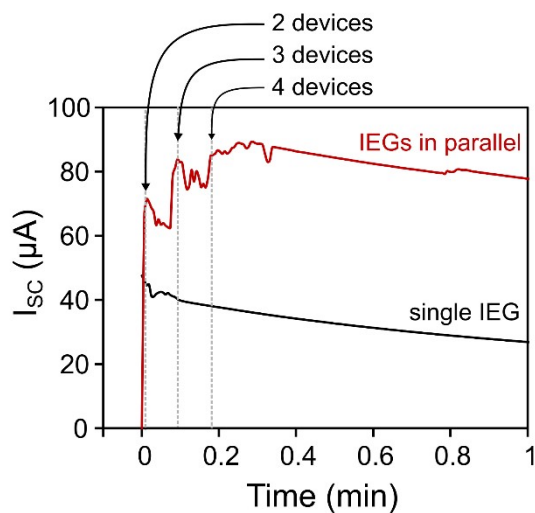
**Figure S3.** Chemical structures of PDDA and PSS with the number of the elements contained in the respective repeating units, as well as their mass. The values shown in the parenthesis after each element is the atomic weight of the element. By simple estimation, the repeating unit of PSS is  $\sim 1.3\times$  times higher than that of PDDA. Thus, given the same molecular weight of the polymer (i.e.  $M_w \sim 200,000 \text{ g/mol}$ ), there are more PDDA repeating units than PSS repeating units.



**Figure S4.** Illustration showing the diffusion direction of Na<sup>+</sup> and Cl<sup>-</sup> in the bilayer and tetralayer cases. In the bilayer, the diffusion occurs only in one direction, whereas in the tetralayer the ions contained in the inner layers diffuse both ways. Regardless, the measured electric potential is the same since the concentration of leftover charges in the outermost PDDA and PSS are the same in both cases.



**Figure S5.** Thermogravimetric analysis (TGA) (solid lines) and derivative weight loss curves (dashed lines) of (a) Agarose, PDDA solution, and Agarose:PDDA = 1:3 HPEG (b) Agarose, PSS solution, and Agarose:PSS = 1:3 HPEG



**Figure S6.** Change in the  $I_{sc}$  as HPEGs are being connected in parallel.