Supporting Information

Polybenzimidazole/Nafion hybrid membrane with improved chemical stability for vanadium redox flow battery application

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Fig. S1 – SEM images of pristine (a)Nafion surface and (b)BIpPBI surface of B20N5 (c) XPS graph of BIpPBI surface

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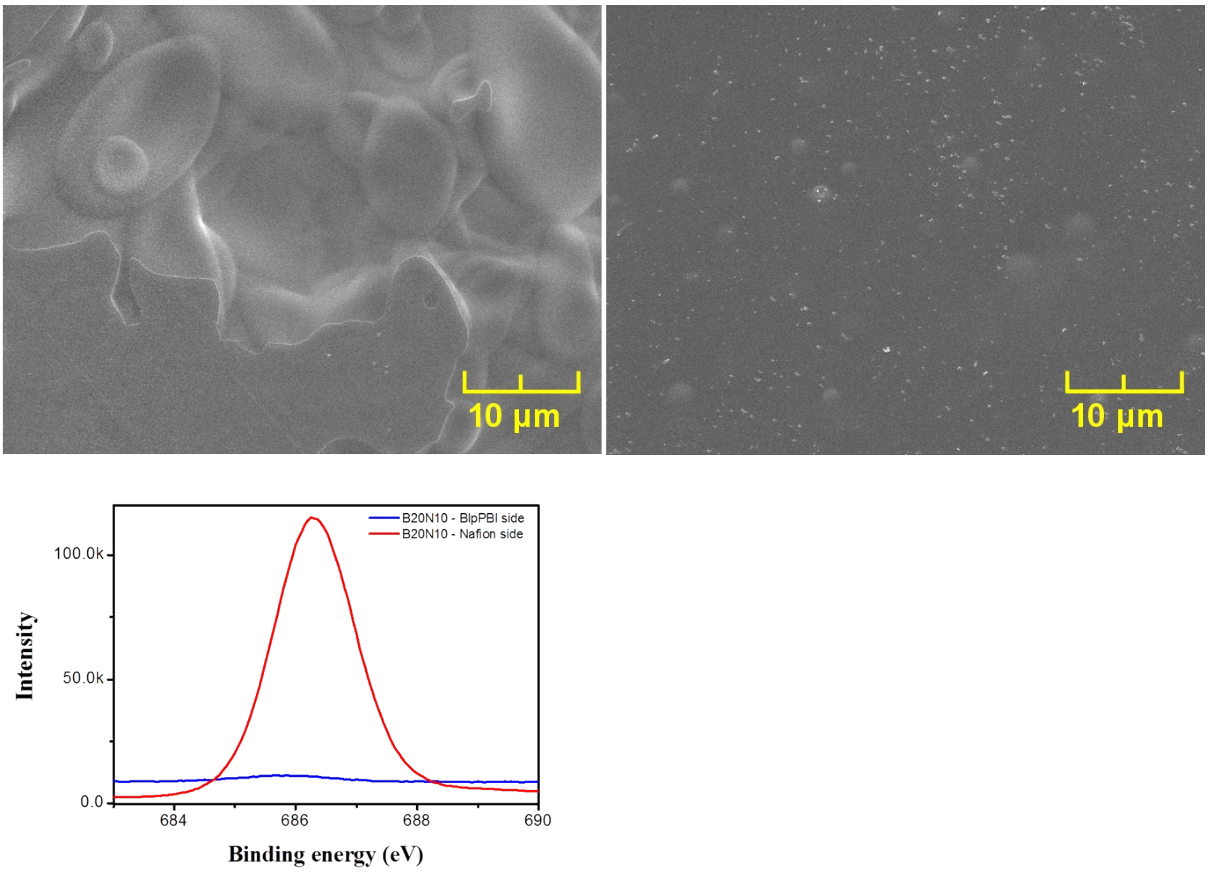
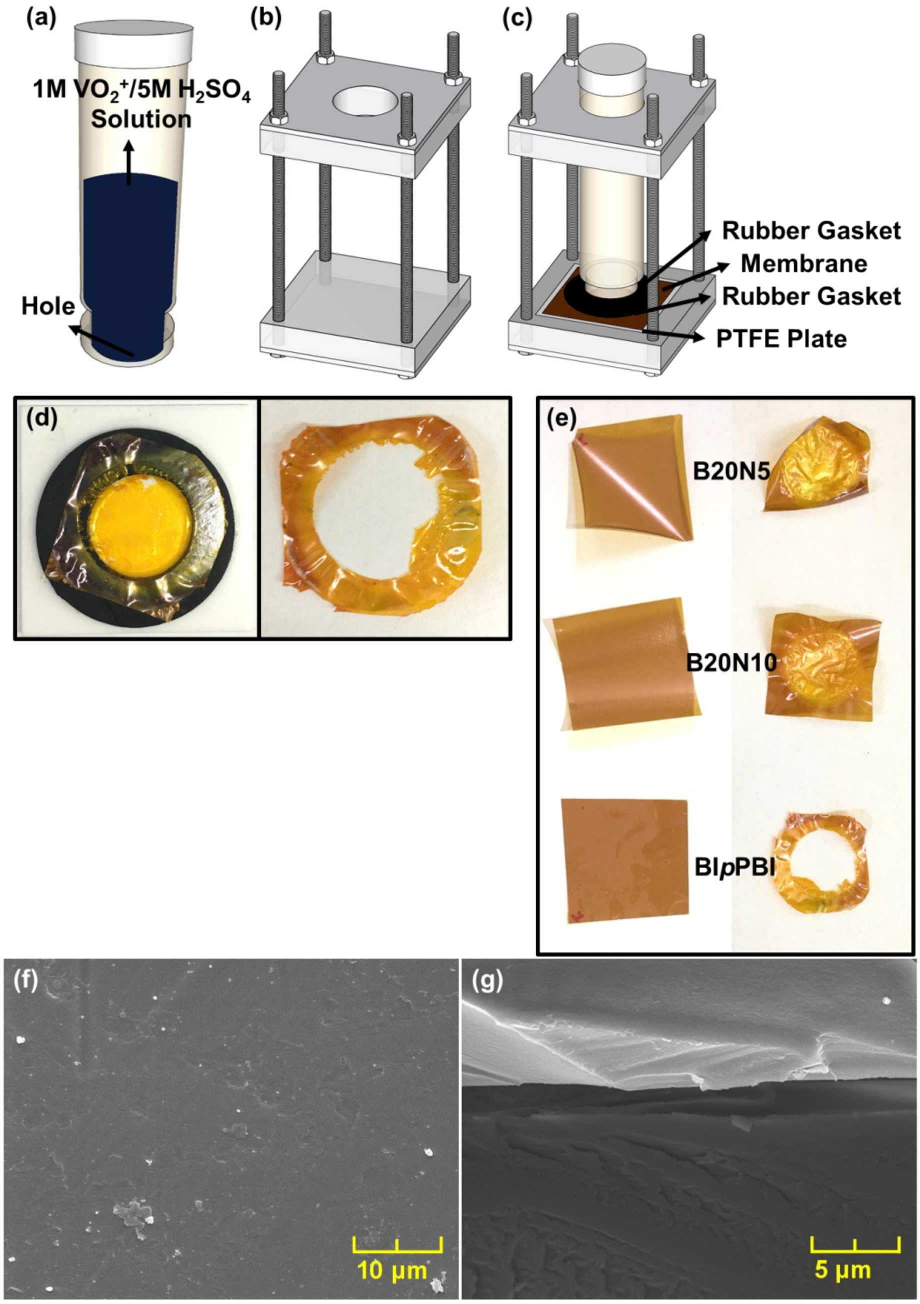


Fig. S2 – Schematics of ex situ chemical stability testing apparatus: (a)cylindrical test tube filled with 1M VO_2^+/5M H_2SO_4 solution, (b)metal container, and (c)cylindrical test tube assembled in the metal container; (d)BIpPBI membrane before (left) and after (right) the test; (e)membranes before (left) and after (right) the test; SEM images of B20N10 after the test for (f)Nafion coated surface and (g)cross section.



When the cylindrical test tube (Fig. S2a) is assembled into the metal container (Fig. S2b), the container is screwed tightly to prevent leakage between the test tube and the membrane. Also, to prevent leakage, a rubber gasket with a hole in the middle was placed above and beneath the membrane, and underneath the rubber gasket a chemically stable PTFE plank was planted to protect the metal container from chemical degradation. The ex situ chemical stability test begins with pouring 20 mL of 1M VO_2^+/5M H_2SO_4 solution in the cylindrical test tube, after setting up the testing apparatus with the membrane inserted, shown in Fig. S2c.

Fig. S3 – SEM images after VRFB performance test of B20N5 membrane's (a)Nafion surface, (b)BI*p*PBI surface, and (c)cross section; BI*p*PBI membrane's (d)surface and (e)cross section.

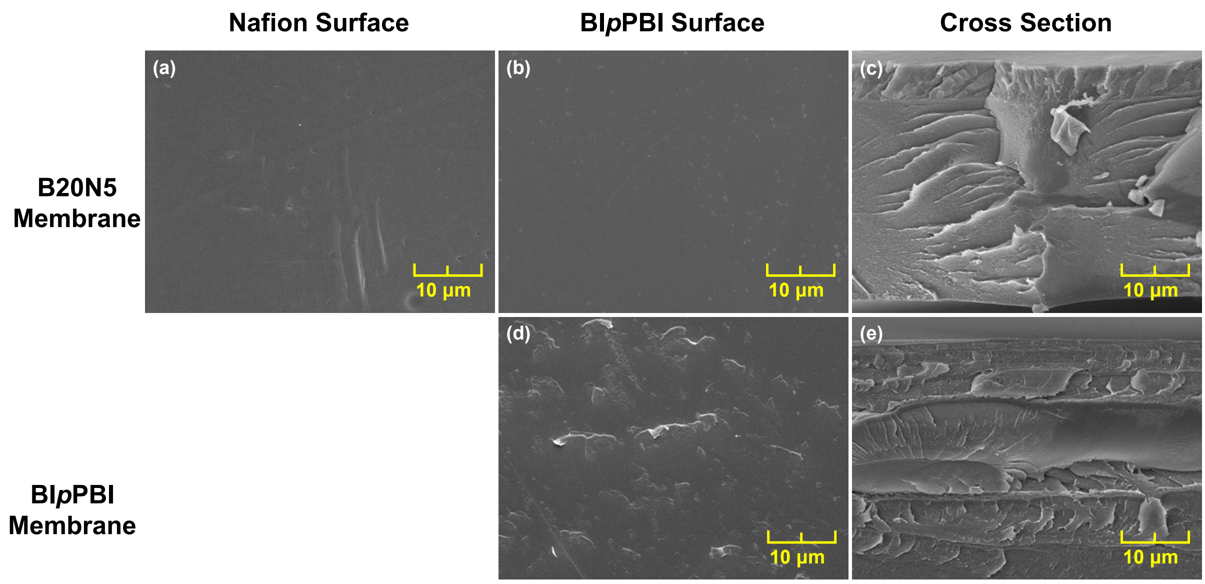


Fig. S4 –Cycling test result of VRFB single cells BI*p*PBI and B20N10 membranes at 60 mA cm^{-2}: (a) BI*p*PBI efficiency, (b) B20N10 efficiency, (a') BI*p*PBI capacity retention, (b') B20N10 capacity retention, and cell voltage of (a'') BI*p*PBI and (b'') B20N10 during charging and discharging after 300 cycles.