

Supplementary Information

Operation of Proton Exchange Membrane (PEM) Fuel Cells using Natural Cellulose Fiber Membranes

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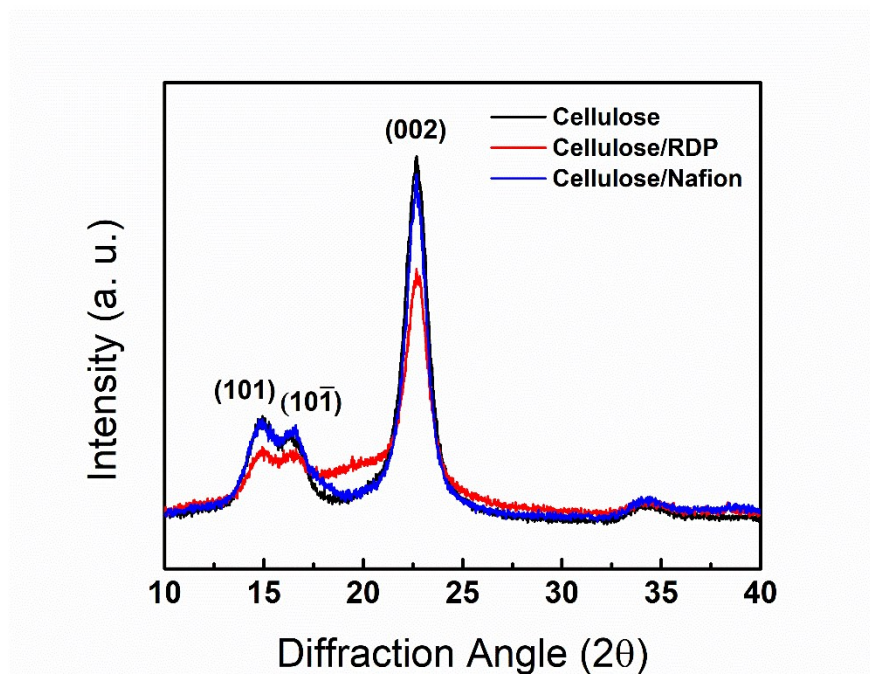


Fig. S1 XRD results of cellulose filter, cellulose/RDP and cellulose/Nafion membranes.

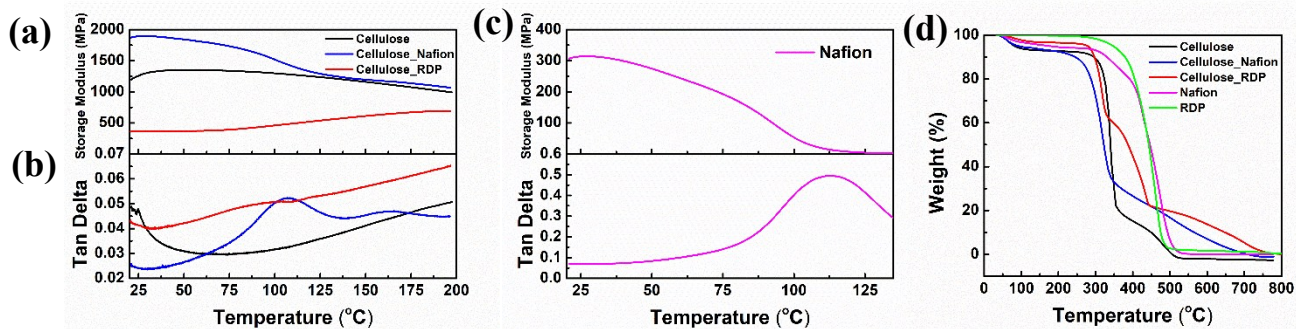


Fig. S2 (a) Storage modulus, (b) tan delta vs temperature curves obtained by DMA of cellulose, cellulose/Nafion, cellulose/RDP membranes. (c) Storage modulus and tan delta vs temperature curves obtained by DMA of Nafion membrane. (d) TGA results of cellulose, cellulose/Nafion, cellulose/RDP, Nafion membranes and RDP sample.

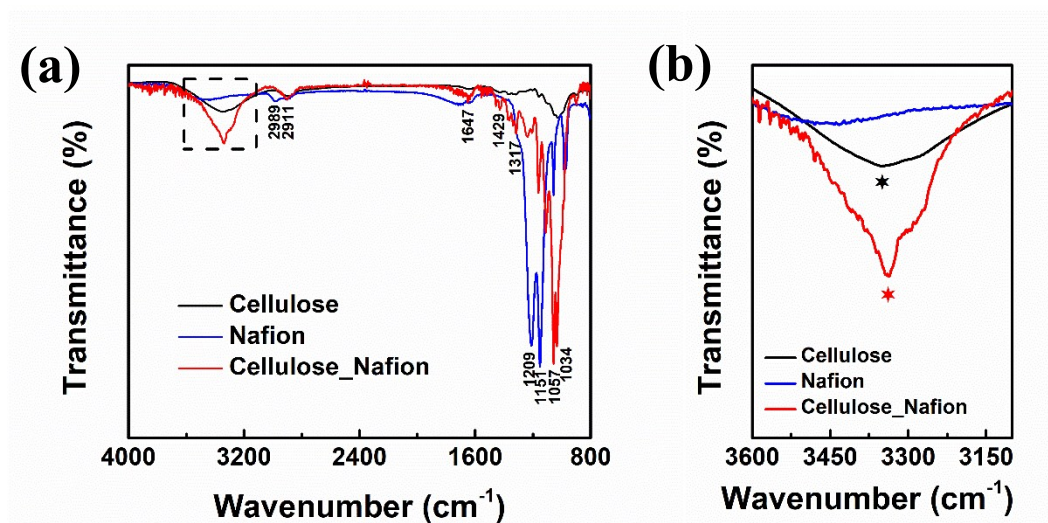


Fig. S3 (a) FTIR and (b) magnified dashed square region in (a) of cellulose membrane, Nafion sample and cellulose/Nafion membrane.

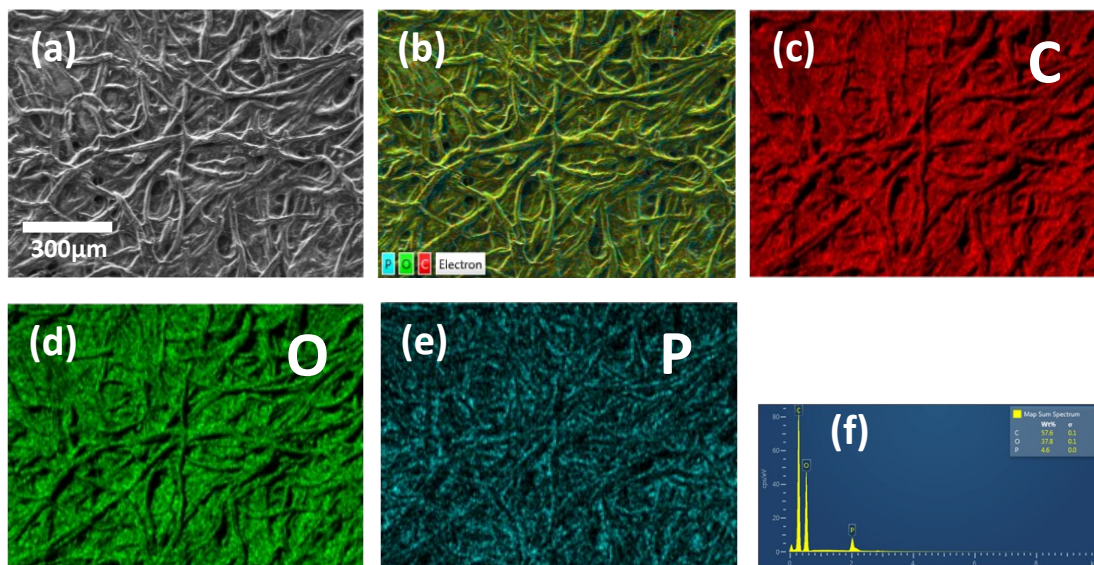


Fig. S4 (a) SEM image, (b) layered element mapping, (c-e) corresponding carbon, oxygen, phosphorus element mappings and (f) elemental analysis image of typical cellulose/RDP membrane.

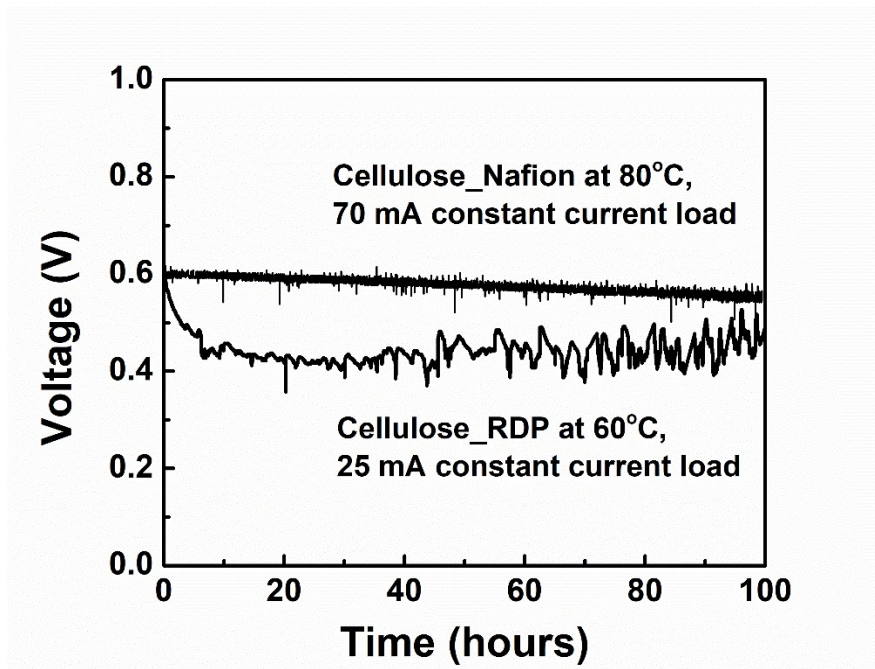


Fig. S5 Voltage output of cellulose/Nafion membrane under 70 mA constant current load at 80°C and cellulose/RDP membrane under 25 mA constant current load at 60°C for 100 hours continuous operation.

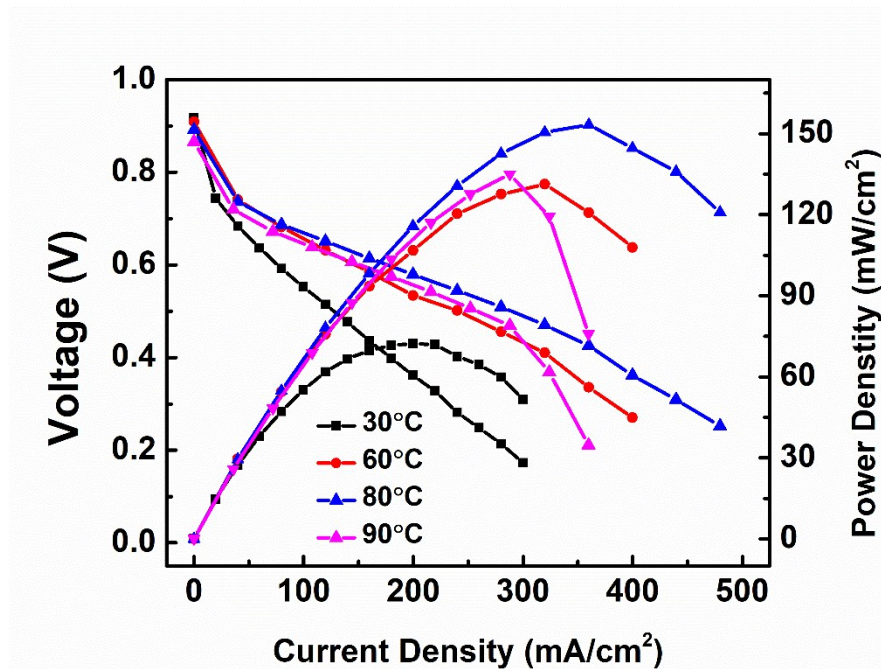


Fig. S6. Polarization and power curves for pure Nafion 117 membrane under various temperature conditions.