PVDF/Graphene Composite Nanoporous Membranes for Vanadium Flow Batteries

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Table S1. Influence of SAS contents on PVDF nanoporous membranes.

SAS Contents (wt %)	Thickness (μm)	Permeability of H^+ ($\times10^{-5}$ $cm^2 \cdot min^{-1}$)	Permeability of VO^{2+} ($\times10^{-7}$ $cm^2 \cdot min^{-1}$)	Selectivity	Proton Conductivity ($mS \cdot cm^{-1}$)
10	140	0.36	0.21	175.2	1.6
15	110	1.14	0.99	114.6	10.0
20	124	3.19	5.07	62.9	20.3
25	123	3.41	12.8	26.6	23.5

Table S2. Water uptakes and proton conductivities of the membranes.

Sample	Thickness (μm)	Water Uptake (%)	Area Resistance ($\Omega \cdot cm^2$)	Proton Conductivity (mS/cm)
PVDF	123	29.1	0.524	23.5
PVDF/G-0.05	124	34.2	0.396	31.3
PVDF/G-0.10	141	33.8	0.451	31.3
PVDF/G-0.15	125	32.3	0.337	37.1
PVDF/G-0.2	115	34.6	0.352	32.6
PVDF/G-0.3	128	38.7	0.417	30.7

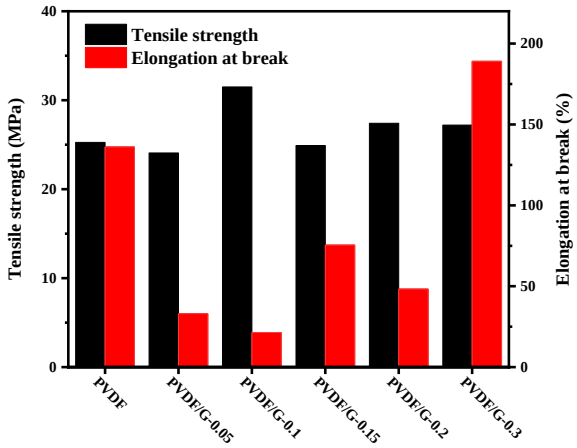

Figure S1. Mechanical properties of PVDF and PVDF/G-0.15 membranes.