Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information

Facile preparation of long-term durable nano- and micro- structured polymer blend membrane for a proton exchange membrane fuel cell

Hye-Jin Lee,[a,b] Yeonhye Kwon,[a] So Young Lee,[a] Jieun Choi,[a] Bo Hyun Kim,[a] Dirk Henkensmeier,[a] Jong Hyun Jang, [a] Sung Jong Yoo, [a] Jin-Young Kim, [a] Hyoung-Juhn Kim,*[a] Hwayong Kim*[b] and Man-Ho Kim*[c c]

[a] Fuel Cell Research Center, Korea Institute of Science and Technology, Seoul 136-791, Republic of Korea.
[b] School of Chemical and Biological Engineering, Seoul National University, Seoul 151-744, Republic of Korea.
[c] Advanced Analysis Center, Korea Institute of Science and Technology, Seoul 136-791, Republic of Korea.

Contents:

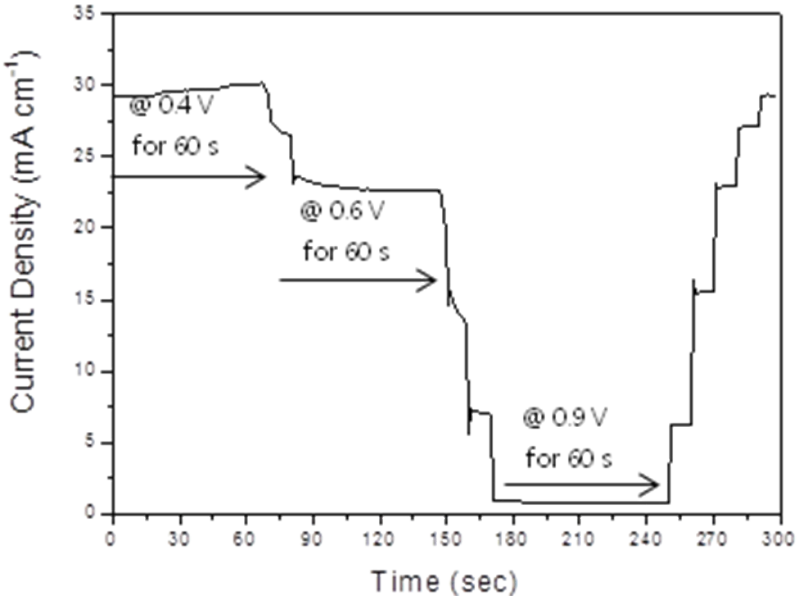

Fig. S1 Voltage profile for fuel cell cycling operation.

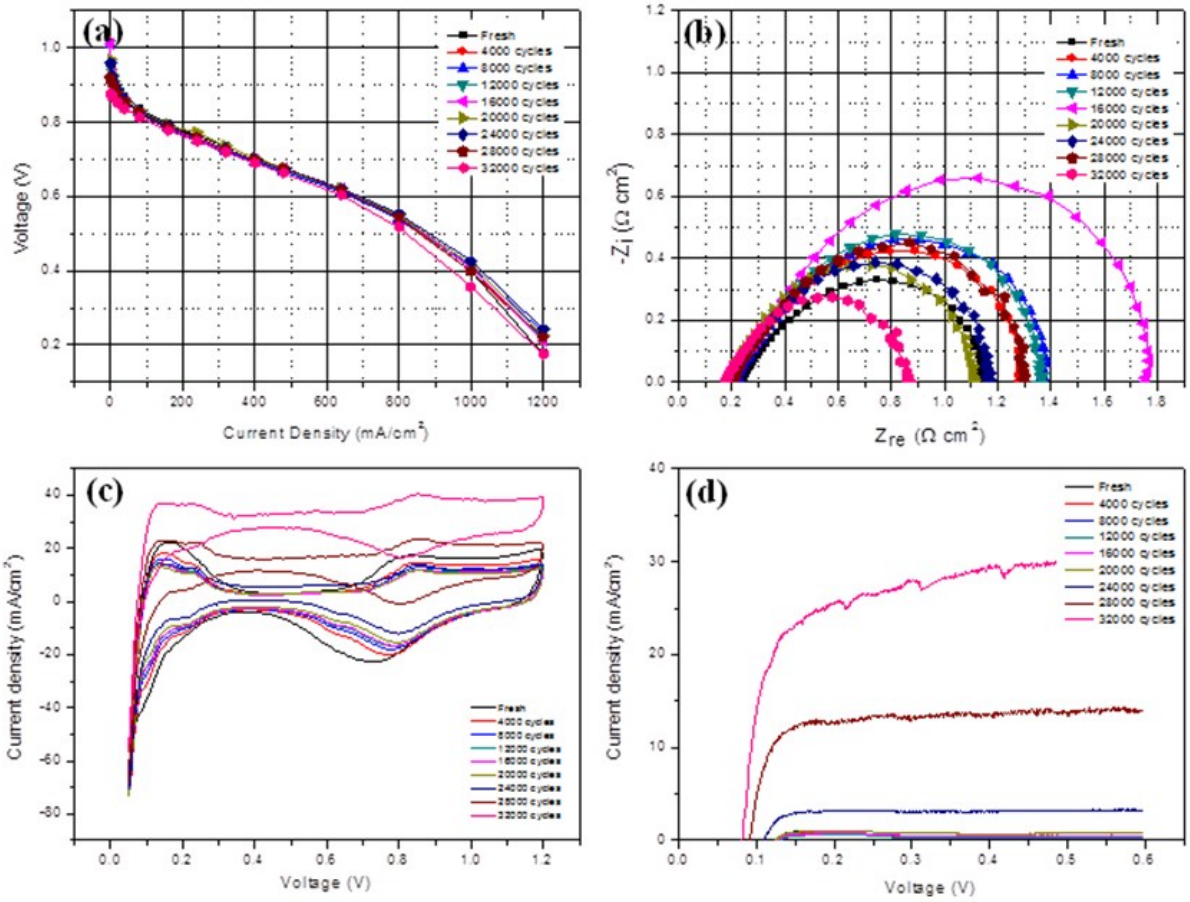

Fig. S2 (a) Polarization curves, (b) impedance, (c) CV, and (d) LSV data of PES 30.

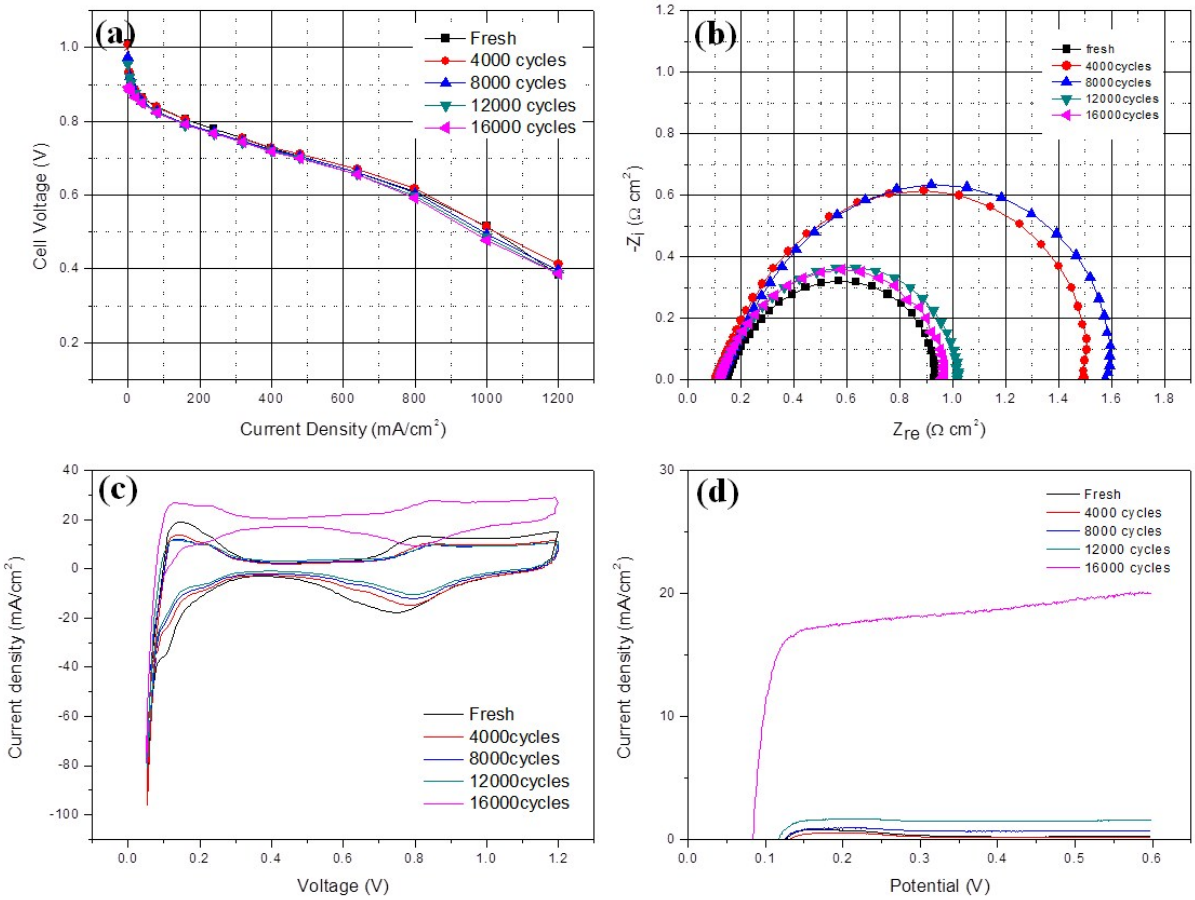

Fig. S3 (a) Polarization curves, (b) impedance, (c) CV, and (d) LSV data of PES 40.

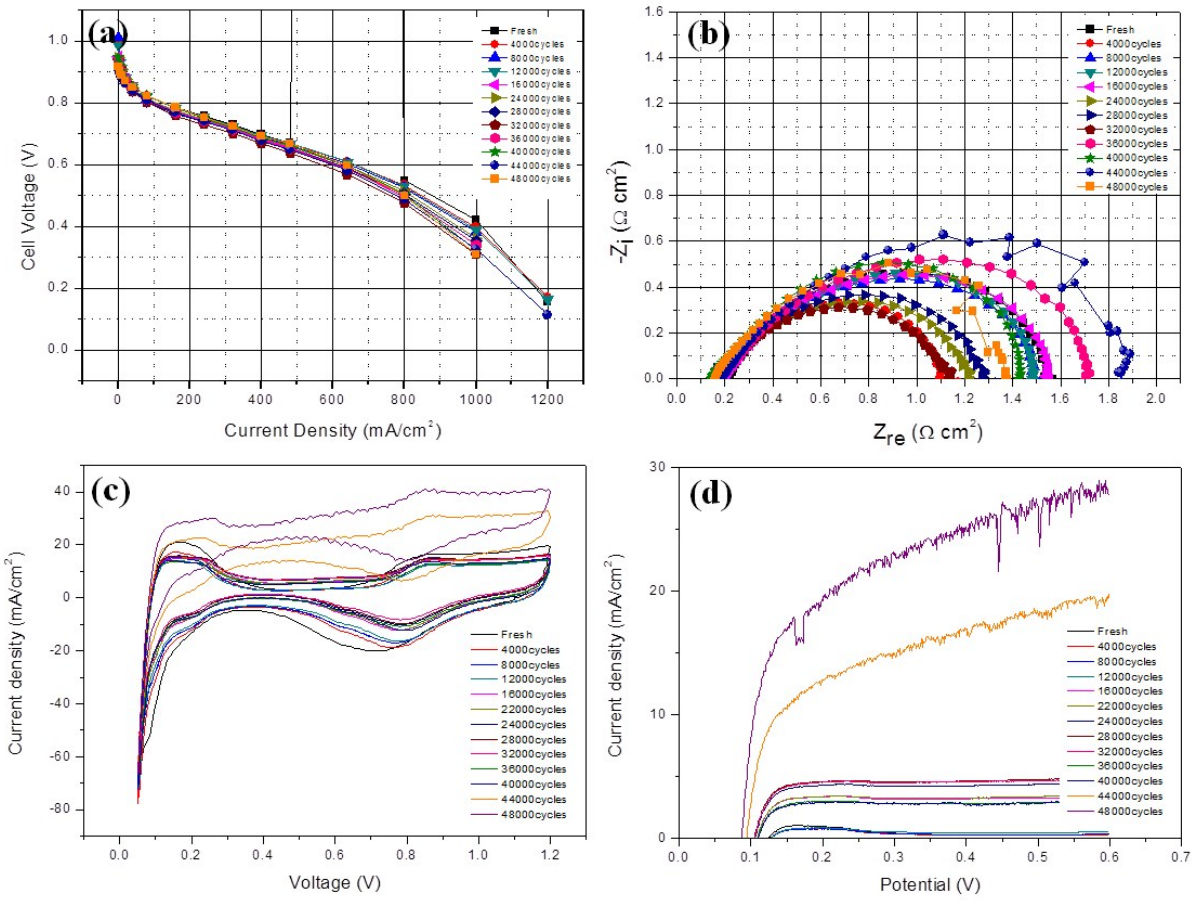

Fig. S4 (a) Polarization curves, (b) impedance, (c) CV, and (d) LSV data of blend membrane.

Table S1 Basic properties of PES 10, 20, 30 and 40.

Polymers	Yanjin™ Catalog No.	Intrinsic viscosity* (dL/g)	Status
PES 10	SES0101	1.0	Light yellow fibrous solid
PES 20	SES0102	0.9	Light yellow fibrous solid
PES 30	SES0103	0.8	Yellow fibrous solid
PES 40	SES0104	0.8	Brown fibrous solid

***** Intrinsic viscosity is measured using Ubbelohde viscometer in NMP containing 0.05 LiBr at 25°C.

Table S2 Electrochemical changes of initial and final performance for the three membranes.

	PES 30		PES 40		Blend	
	initial	32000 cycles	initial	16000 cycles	initial	48000 cycles
OCV [V]	1.01	0.88	1.01	0.89	1.01	0.92
Current density @ 0.6 V [mA cm^{-1}] (IR-free, [mA cm^{-1}])	675 (1040)	647 (892)	808 (1126)	781 (996)	677 (954)	538 (713)
Ohmic resistance [Ω cm^2]	0.24	0.18	0.15	0.12	0.22	0.16
EAS [m^2 g^{-1}] (Relative EAS, [%])	71.86 (100)	16.81 (23)	67.4 (100)	22.74 (34)	75.68 (100)	9.02 (12)
H_2 crossover rate @ 0.4 V [mA cm^{-1}]	0.27	29.35	0.22	18.77	0.24	25.07