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Supporting Information

Modification of electrodes using Al_2O_3 to reduce phosphoric acid loss and increase the performance of high-temperature proton exchange membrane fuel cells

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Table S1. Summary of electrochemical results of HT-PEMFCs with different amount of aluminum oxide (Al_2O_3).

Al_2O_3 loading (wt%)	MEA performance at 0.6V (Acm^{-2})	ECSA[a] (m^2g^{-1})	Ohmic resistance (Ω)	Charge transfer resistance (Ω)
0	0.26	10.0	0.059	0.825
3	0.28	10.9	0.059	0.746
6	0.33	12.3	0.056	0.714
8	0.25	9.8	0.068	0.831

[a] The electrochemical surface area (ESA) of Pt/C was investigated under MEA condition. The ESA evaluated from the electric charge of the hydrogen desorption wave in each CV

Table S2. Summary of changes before and after durability test of MEAs with 6 wt% Al_2O_3 in the electrode and that without Al_2O_3.

Sample	MEA performance at 0.6V (Acm^{-2})		ESA[a] (m^2g^{-1})		Charge transfer resistance (Ω)	
	Before	After	Before	After	Before	After
Al_2O_3 0%	0.26	0.151	10.0	5.2	0.825	1.645
	-41.9%		-48.0%		+99.3%	
Al_2O_3 6%	0.33	0.238	12.3	9.2	0.714	1.018
	-27.9%		-25.2		+42.5%	

[a] The electrochemical surface area (ESA) of Pt/C was investigated under MEA condition. The ESA evaluated from the electric charge of the hydrogen desorption wave in each CV.

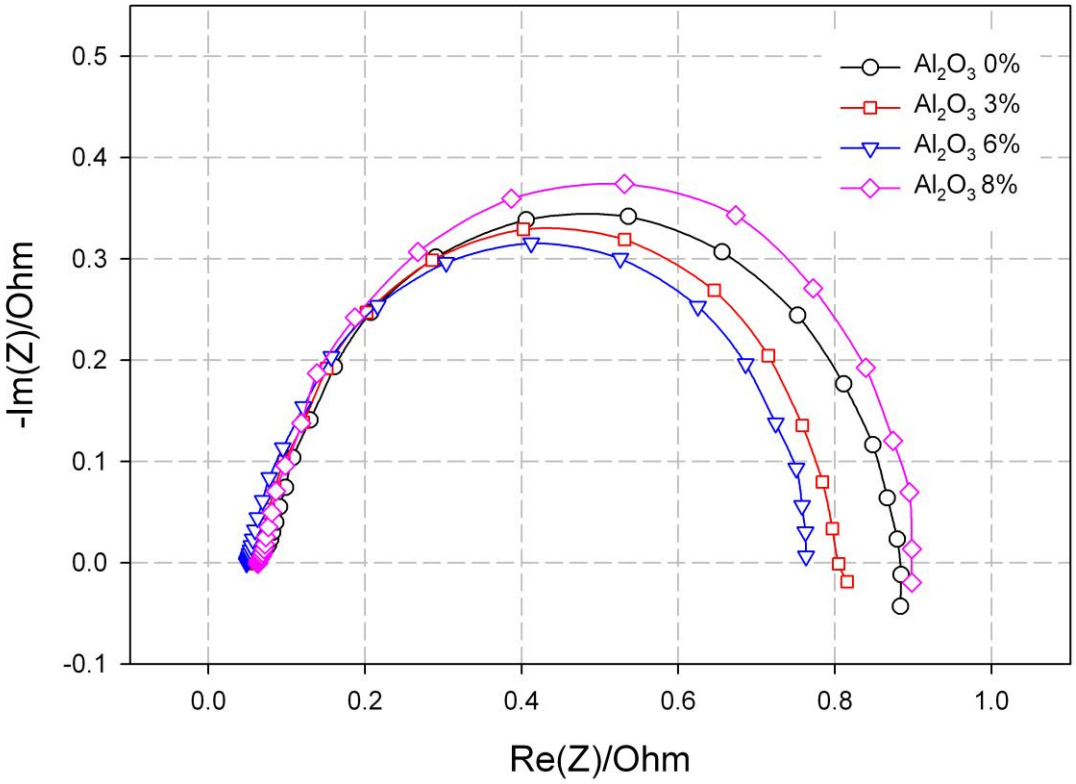

Figure S1. Impedance analysis of MEAs with different amount of Al_2O_3 in the electrode at 0.8 V between 0.1 and 5 kHz.

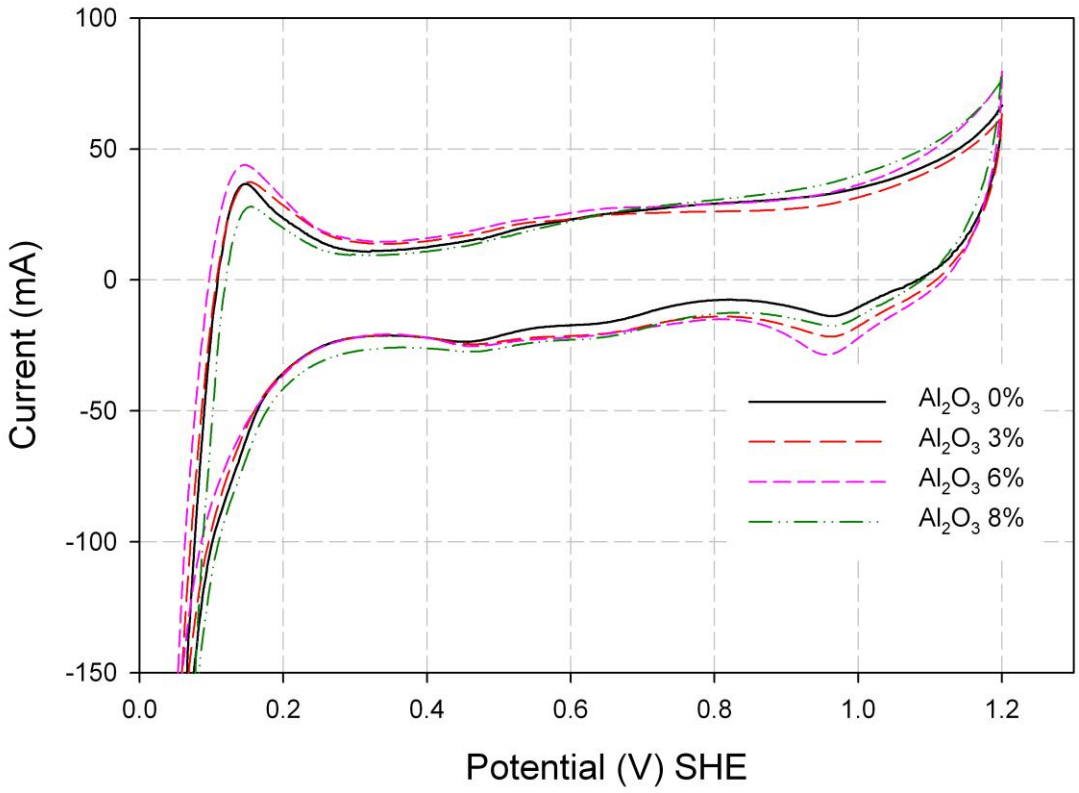

Figure S2. Cyclic voltammograms of MEAs with different amount of Al_2O_3 in the electrode at a scan rate of 50 mV s^{-1}.

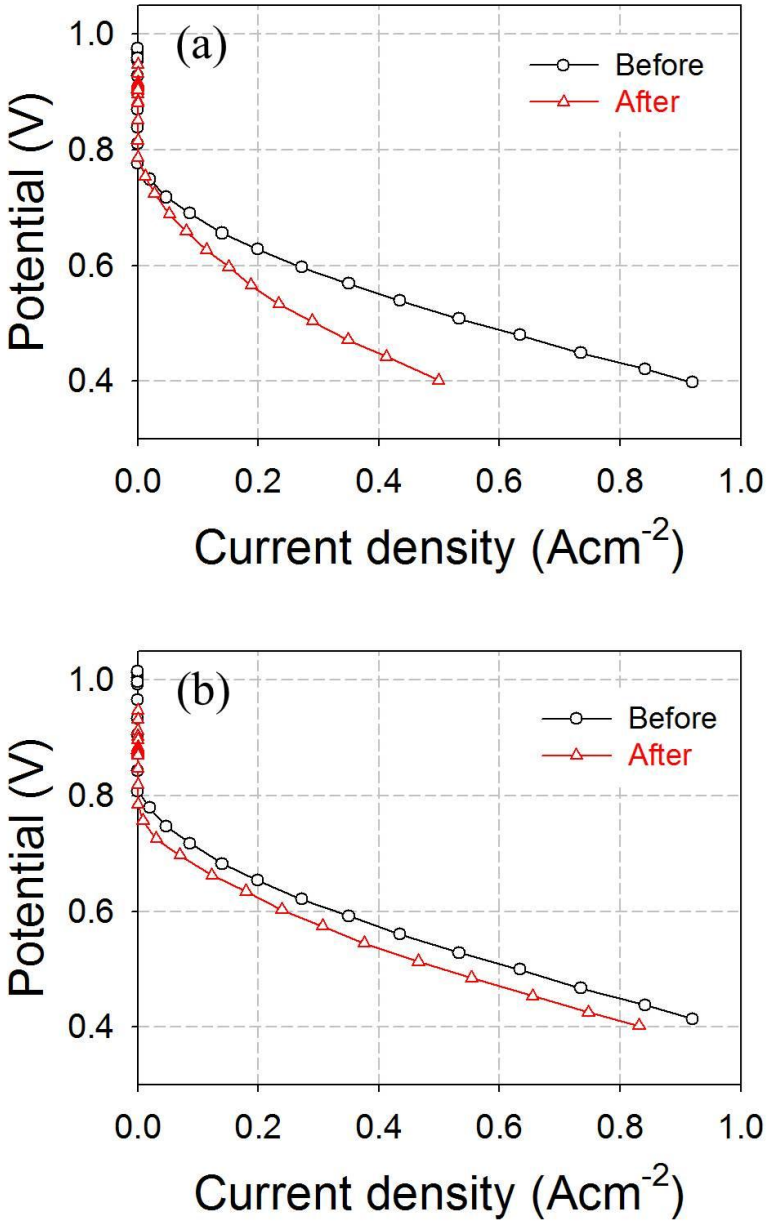

Figure S3. Comparison of MEA performances before and after the durability tests using (a) MEA without Al_2O_3 and (b) MEA containing 6 wt % Al_2O_3.

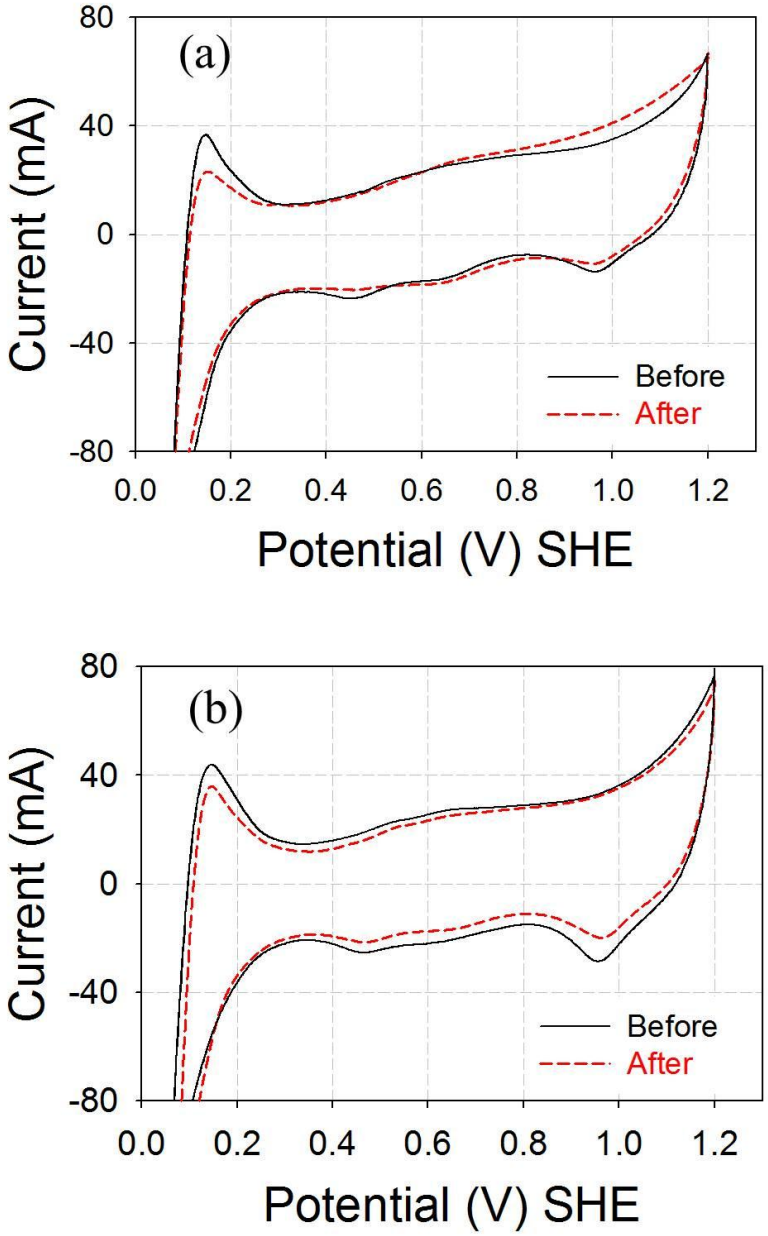

Figure S4. Cyclic voltammograms before and after the durability test using (a) MEA without Al_2O_3 and (b) MEA containing 6 wt% Al_2O_3.

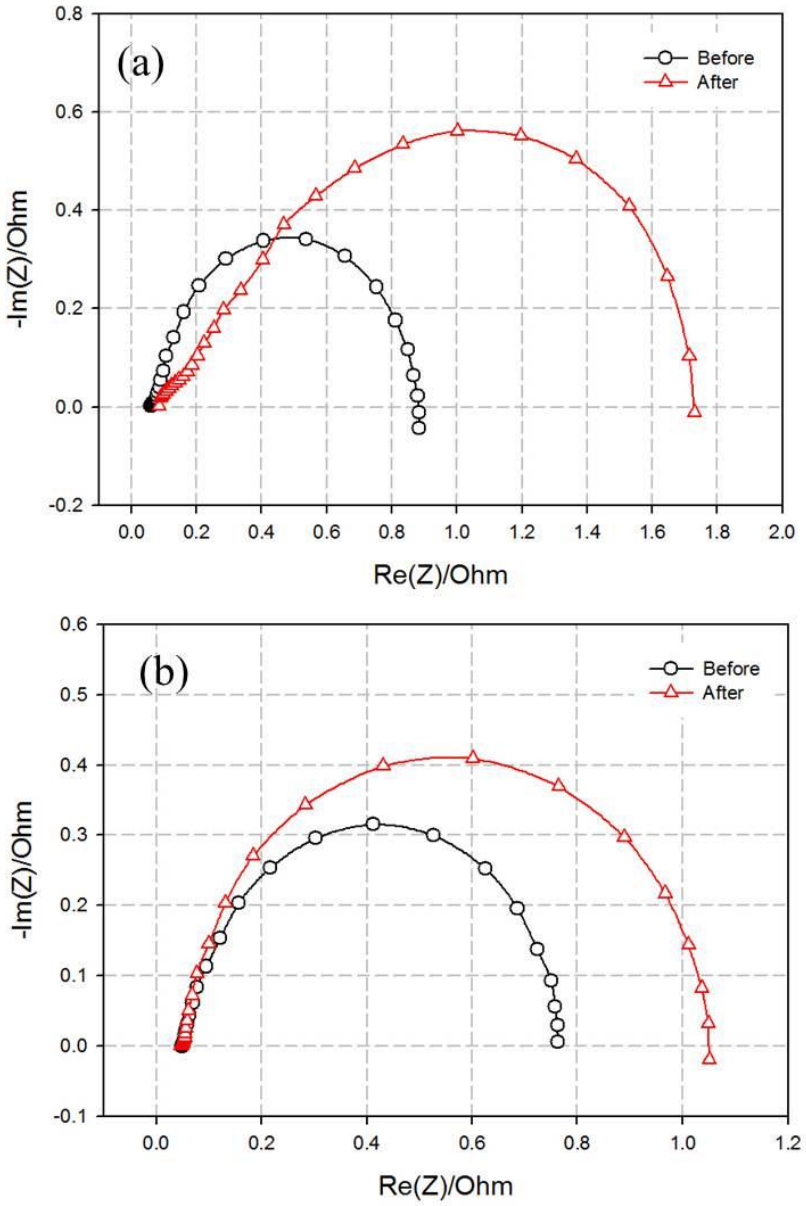

Figure S5. Nyquist plots of MEAs using different aluminum oxide (Al_2O_3) at 0.8V before and after durability test. (a) Al_2O_3 0 wt%, (b) Al_2O_3 6 wt%.