

Electronic Supplementary Information (ESI)

for

Phosphoric acid-doped electrocatalyst supported on poly(*para*-pyridine benzimidazole)-wrapped carbon nanotubes shows a high durability and performance

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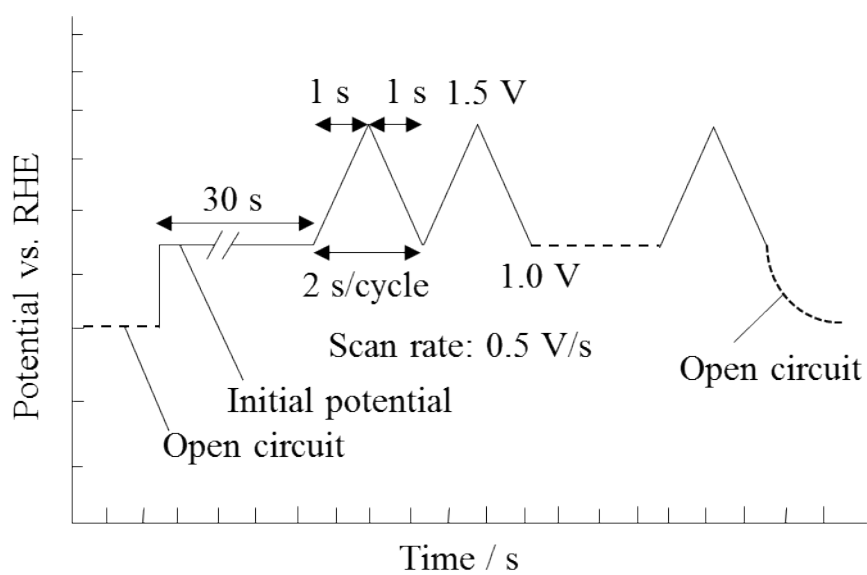


Fig. S1. New test protocol of durability test for a half-cell proposed by the Fuel Cell Commercialization Conference of Japan (see K. Shinohara, A. Ohma, A. Iiyama, T. Yoshida and T. Daimaru, *ECS Trans.*, 2011, **41**, 775-784).

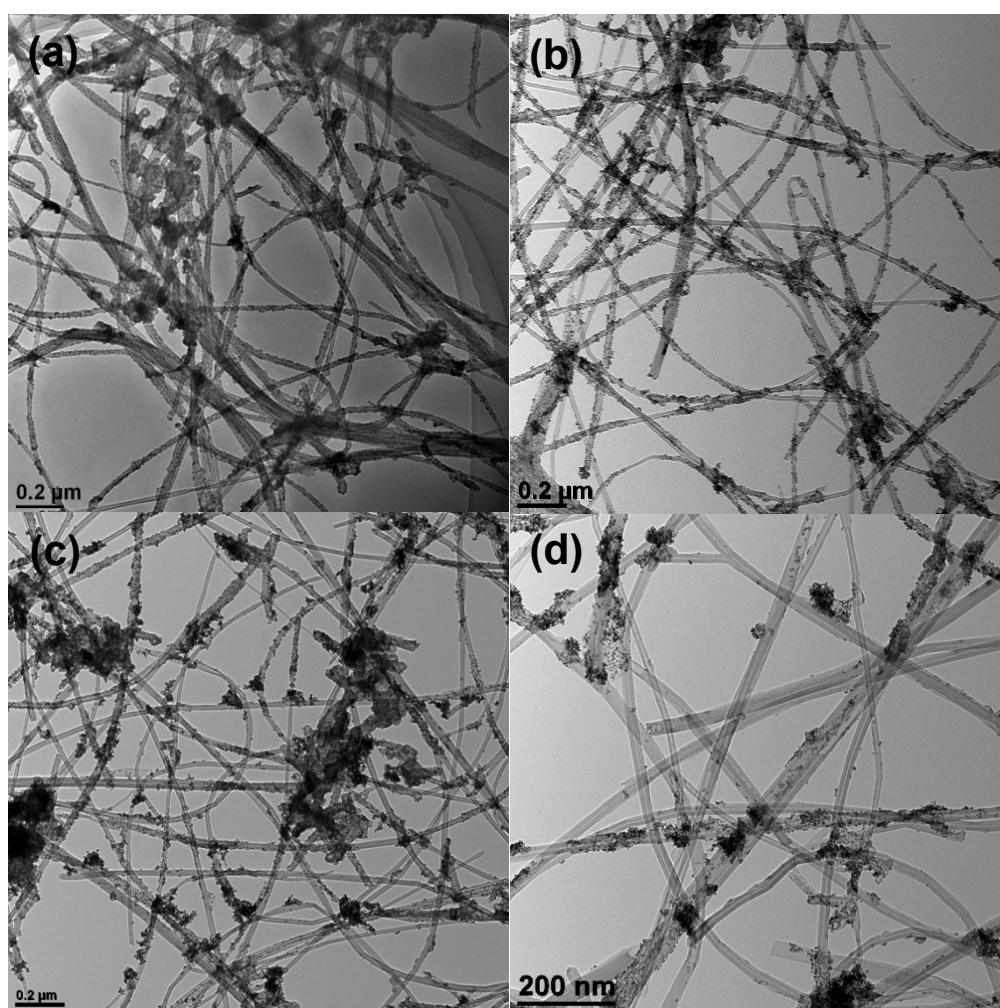


Fig. S2. TEM images of the MWNTs/*para*-PyPBI/Pt (a) and the PA-doped MWNTs/*para*-PyPBI/Pt (PA doping times are: 15 min (b), 1 h (c) and 3 h (d)).

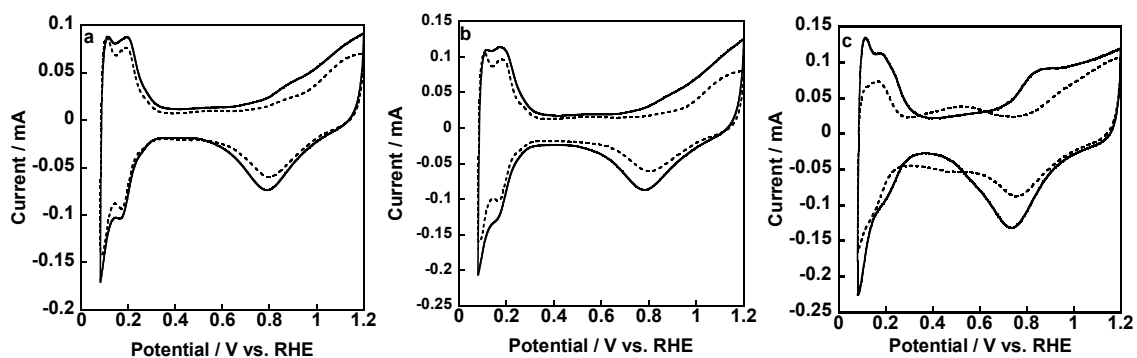


Fig. S3. CV curves of the MWNTs/*para*-PyPBI/Pt (a), MWNTs/*para*-PyPBI-PA/Pt (b) and CB/Pt (c) before (solid line) and after (dotted line) the durability test recorded in 0.1M HClO₄ at the scan rate of 50 mV s⁻¹.

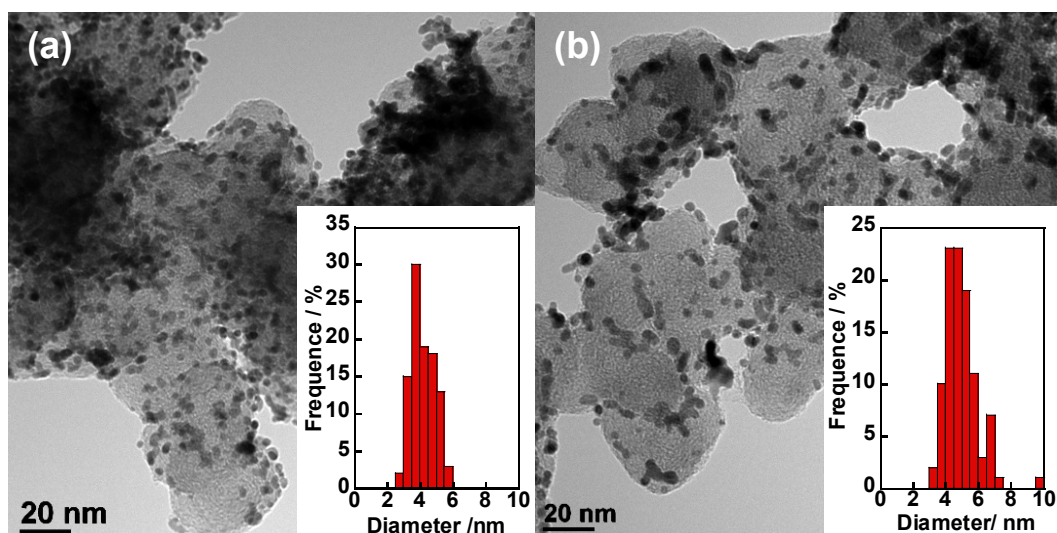


Fig. S4. TEM images of the conventional CB/Pt before (a) and after the durability test (b).

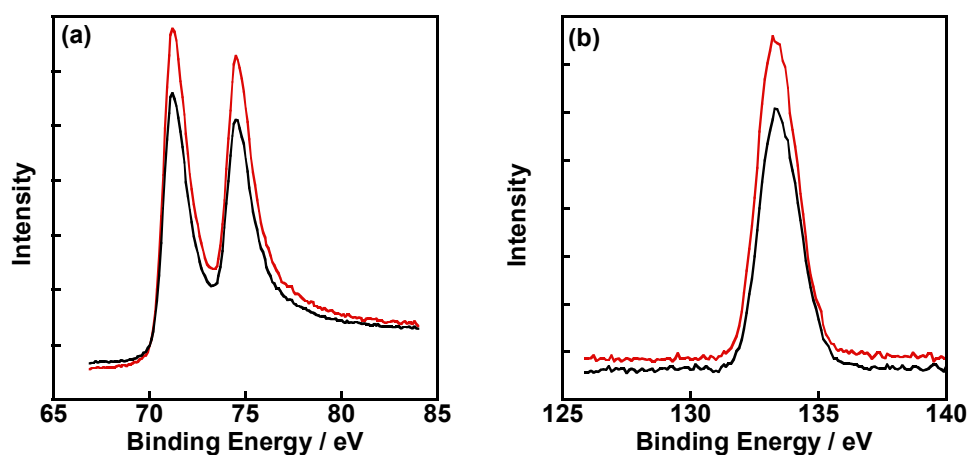


Fig. S5. Narrow scans of the XPS spectra for the GDE fabricated from MWNTs/*para*-PyPBI-PA/Pt in the regions of the Pt_{4f} (a) and P_{2p} (b) before (red) and after (black) fuel cell testing.

Table S1. D/G ratios of the pristine MWNTs, MWNTs/*para*-PyPBI, MWNTs/*para*-PyPBI/Pt and MWNTs/*para*-PyPBI-PA/Pt.

Sample	MWNTs	MWNTs/ <i>para</i> -PyPBI	MWNTs/ <i>para</i> -PyPBI/Pt	MWNTs/ <i>para</i> -PyPBI-PA/Pt
D/G ratio	0.31	0.31	0.33	0.35

Table S2. Comparison of surface elemental compositions of the GDE fabricated from MWNT/*para*-PyPBI-PA/Pt before and after fuel cell testing.

	Pt _{4f} (wt%)	P _{2p} (wt%)
Before	90.4	9.6
After	91.1	8.9