

## Supporting Information for

# Durability Analysis of Polymer-coated Pristine Carbon Nanotube-based Fuel Cell Electrocatalyst at Non-humidified Conditions

Mohamed R. Berber<sup>a,d</sup>, Inas H. Hafez<sup>a,e</sup>, Tsuyohiko Fujigaya<sup>a,b,\*</sup> and Naotoshi Nakashima<sup>a,b,c,\*</sup>

<sup>a</sup>International Institute for Carbon Neutral Energy Research (WPI-I2CER), Kyushu University, Fukuoka 819-0395, Japan

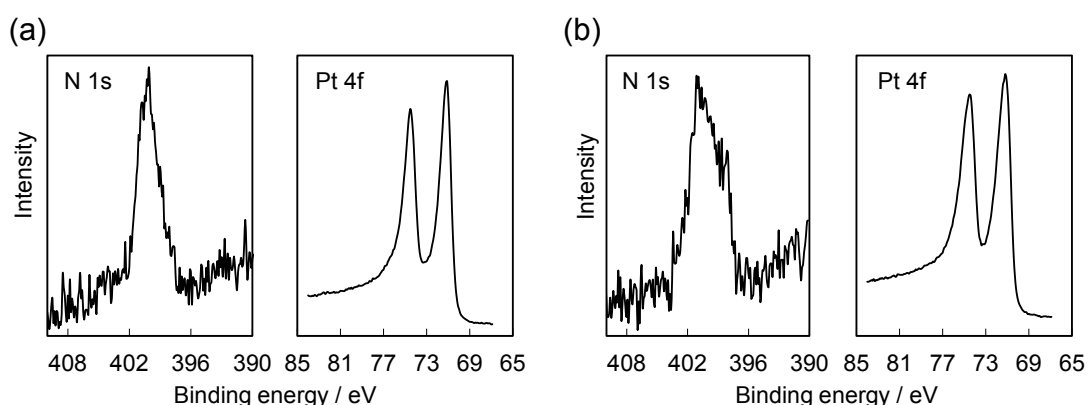
<sup>b</sup>Department of Applied Chemistry, Graduate School of Engineering, Kyushu University, 744 Motoooka, Nishi-ku, Fukuoka 819-0395, Japan.

<sup>c</sup>JST-CREST, 5 Sanbancho, Chiyoda-ku, Tokyo, 102-0075, Japan

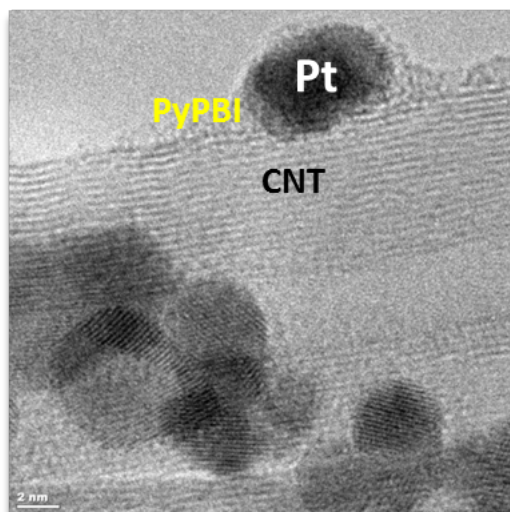
<sup>d</sup>Department of Chemistry, Faculty of Science, Tanta University, Tanta 31527, Egypt

<sup>e</sup>Department of Natural Resources and Agricultural Engineering, Faculty of Agriculture, Damanshour University, Damanshour 22516, Egypt

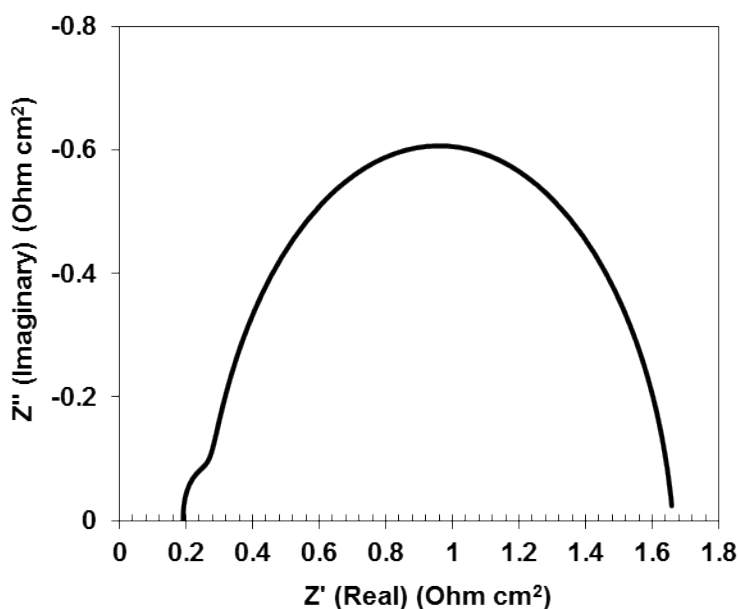
E-mail: fujigaya-tcm@mail.cstm.kyushu-u.ac.jp, nakashima-tcm@mail.cstm.kyushu-u.ac.jp.



**Figure S1.** XPS narrow scans of (a) CB/PyPBI/Pt and (b) CNT/PyPBI/Pt for N1s (left) and Pt4f (right).



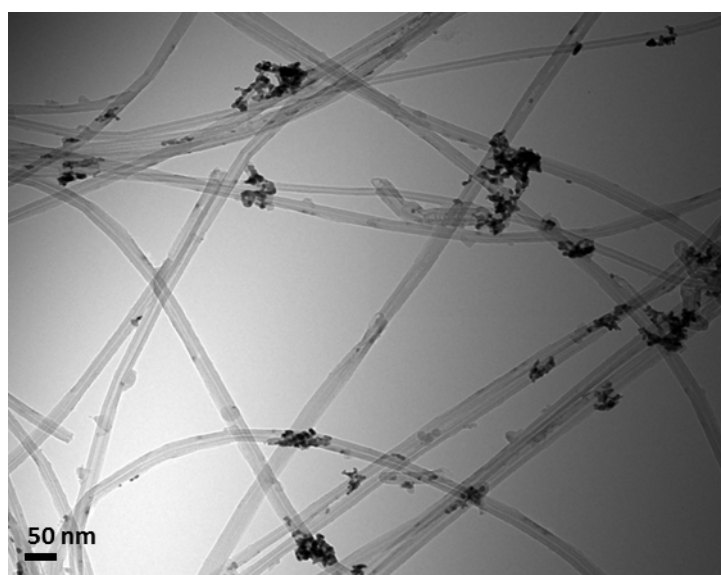
**Figure S2.** A high resolution TEM image of CNTs/PyPBI/Pt composite. Scale bar; 2 nm.



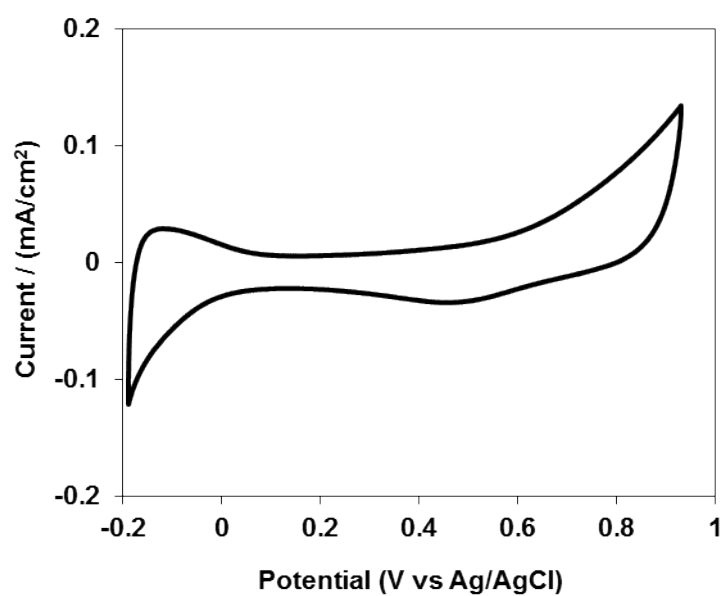
**Figure S3.** The Nyquist plot of CNT/Pt based-MEA at 100 mA/cm<sup>2</sup>.

**Table S1.** List of impedance obtained from CNTs/PyPBI/Pt based-MEA and CNTs/Pt based-MEA

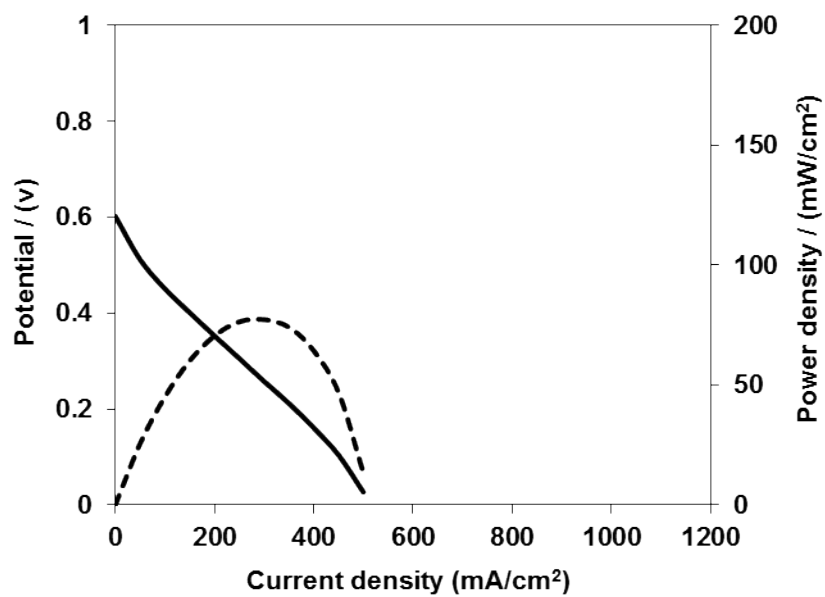
	@ 100 mA/cm <sup>2</sup>		
	CNTs/PyPBI/Pt based-MEA	CNTs/Pt based-MEA	% of increase
R <sub>Ω</sub> (mOhm cm <sup>2</sup> )	142	195	37%
R <sub>ct</sub> (mOhm cm <sup>2</sup> )	58	68	17%
R <sub>g</sub> (mOhm cm <sup>2</sup> )	651	1400	53%



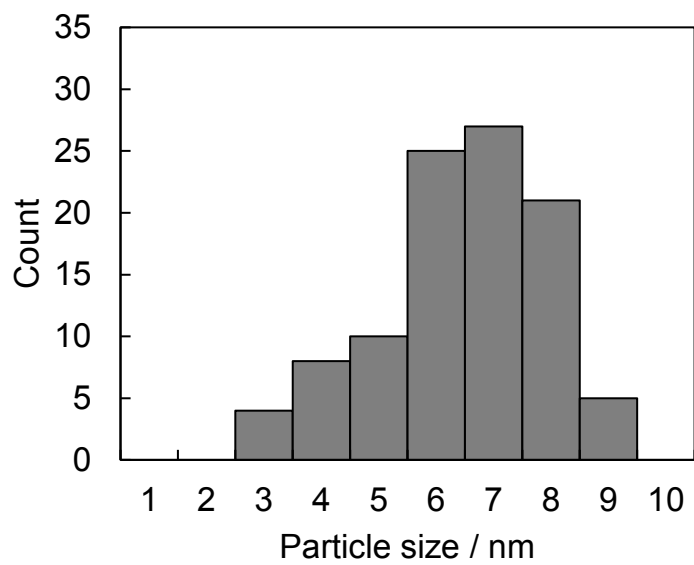
**Figure S4.** TEM image of CNTs/Pt catalyst. Scale bar; 50 nm.



**Figure S5.** CV of the CNTs/Pt electrocatalyst.



**Figure S6.** Polarization curve (solid line) and power density curve (dashed line) of CNTs/Pt base-MEA.



**Figure S7.** Diameter histogram of the CB/PyPPBI/Pt after the durability test.