

A Highly Efficient and Stable Oxygen Reduction Reaction on Pt/CeO_x/C Electrocatalyst Obtained via a Sacrificial Precursor Based on a Metal-Organic Framework.

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Context:

Section 1: Results of X-ray photoelectron spectroscopy (XPS).

Section 2: Results of electrochemistry for SMOF and SCNT samples.

Section 3: Accelerated stability test for SMOF-3, SCNT-2 and Pt/C (JM) samples.

Section 4: IR-drop correction for micro laminar flow fuel cell.

Section 1: Results of X-ray photoelectron spectroscopy (XPS).

Table S1-1. Analysis of the Pt 4fXPS data for the SMOF-1 and SMOF-3 materials			
Sample	Single chemical components of the Pt 4f _{7/2} peak		
	Pt ⁰	Pt ²⁺	Pt ⁴⁺
SMOF-1	71.2 eV	72.9 eV	74.6 eV
	1.3	1.5	1.5
	80.5 %	11.8 %	8.0 %
SMOF-3	71.1 eV	72.9 eV	74.7 eV
	1.3	1.5	1.5
	84.0 %	8.8 %	7.2 %

Table S1-2. Analysis of the C 1sXPS data for for the SMOF-1 and SMOF-3 materials					
Sample	Single chemical components of the C 1s peak				
	C sp ²	C sp ³	Alcohols	Carbonyl groups	Carboxylic groups
SMOF-1	284.3 eV	285.4 eV	286.6 eV	288.0 eV	289.1 eV
	1.1	1.4	1.4	1.4	1.4
	60.9 %	20.4 %	7.9 %	3.5 %	7.3 %
SMOF-3	284.4 eV	285.5 eV	286.6 eV	----	289.1 eV
	1.1	1.4	1.4		1.4
	86.3 %	8.1 %	3.1 %		2.5 %

Table S1-3. Analysis of the Ce 3d XPS data for SMOF-1 and SMOF-3 materials		
Sample	Single chemical components of the Ce 3d _{5/2} peak (Ce ³⁺)	
	f ²	f ¹
SMOF-1	882.1 eV 2.8 14.5 %	886.2 eV 5 85.5 %
SMOF-3	882.3 eV 3.2 26 %	886.2 eV 4.6 74 %

Section 2: Results of electrochemistry for SMOF and SCNT samples.

Table S2. Electrochemical surface area (ECSA / m ² g ⁻¹ _{Pt}) derived from the H _{upd} region and CO-stripping, as well as the geometric surface area calculated from the mean particle size.			
Sample	ECSA (H _{upd})	ECSA (CO-stripping)	Geometric surface area
SMOF-1	48 ± 3	53 ± 10	140
SMOF-2	56 ± 2	58 ± 9	90
SMOF-3	72 ± 5	68 ± 3	55
SCNT-1	64 ± 4	72 ± 3	122
SCNT-2	48 ± 3	60 ± 2	58
SCNT-3	21 ± 2	6 ± 1	23
Pt/C (JM)	78 ± 3	66 ± 2	133

Section 3: Accelerated durability test (ADT) for SMOF-3, SCNT-2 and Pt/C (JM)

samples in the potential interval of 0.6 – 1.0 V/RHE.

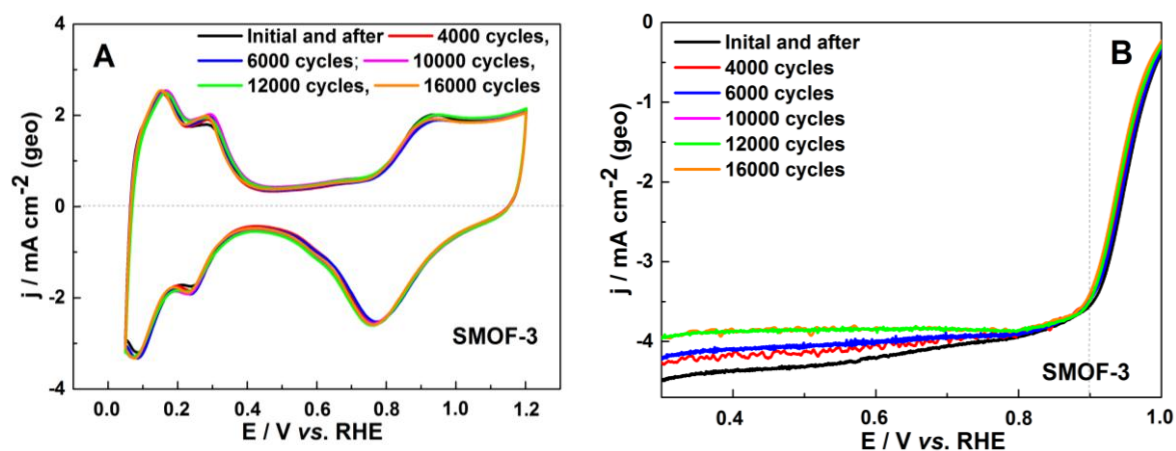


Figure S3-1. (A) CVs recorded at scan rate of 50 mV s^{-1} in N_2 -saturated 0.1 M HClO_4 and (B) LSVs on RDE with rotating speed of 900 rpm at scan rate of 5 mV s^{-1} in O_2 -saturated 0.1 M HClO_4 during stability test for SMOF-3 sample.

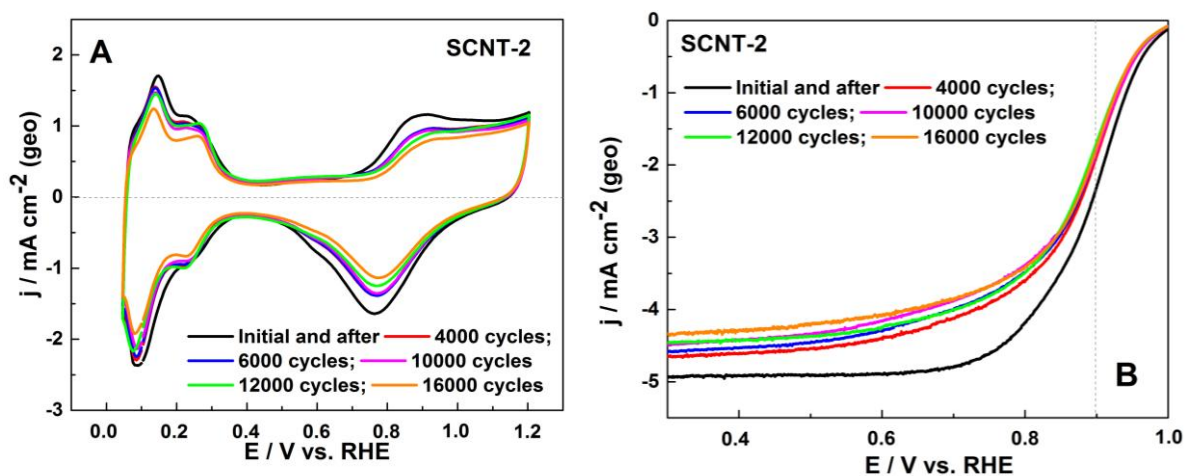


Figure S3-2. (A) CVs recorded at scan rate of 50 mV s^{-1} in N_2 -saturated 0.1 M HClO_4 and (B) LSVs on RDE with rotating speed of 900 rpm at scan rate of 5 mV s^{-1} in O_2 -saturated 0.1 M HClO_4 during the durability test for SCNT-2 sample.

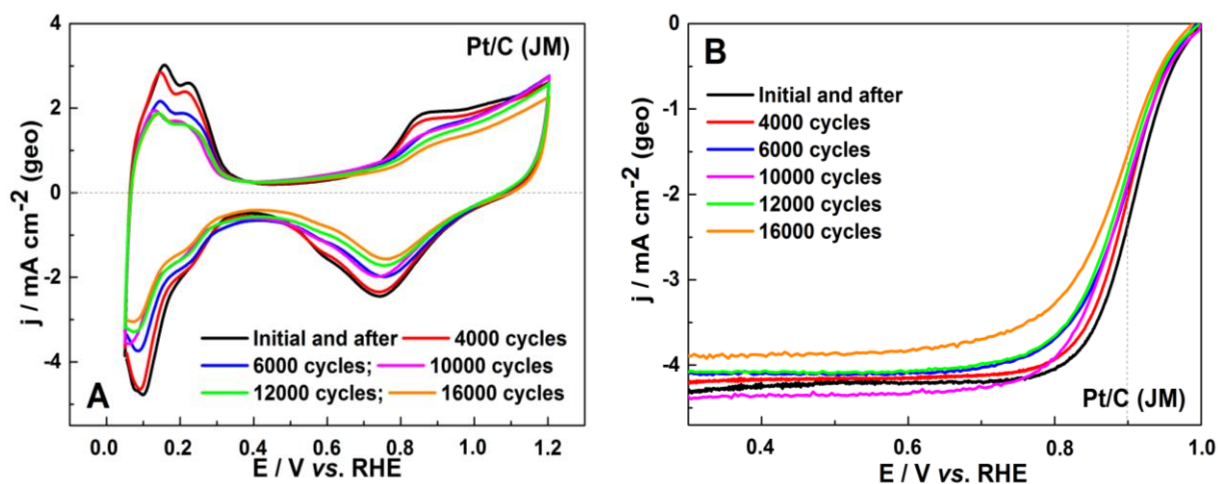


Figure S3-3. (A) CVs recorded at scan rate of 50 mV s^{-1} in N_2 -saturated 0.1 M HClO_4 ; and (B) LSVs on RDE with rotating speed of 900 rpm at scan rate of 5 mV s^{-1} in O_2 -saturated 0.1 M HClO_4 during the durability test for Pt/C (JM).

Section 4: IR-drop correction for micro laminar flow fuel cell.

IR-drop of micro fuel cell was measured using the PEIS method with a potentiostat/galvanostat (SP-300 Biologic Science Instruments) applying a frequency of 10 kHz in a punctual measurement of the assembled micro-fluidic cell. Resistance values for cathode and anode are summarized in **Table S3**. The corrected electrodes' potential, cell potential and power density was done using equations (1 – 4).

$$E'(\text{cathode}) = E(\text{cathode}) + i(\text{cathode}) \times R(\text{cathode})/1000 \quad (1)$$

$$E'(\text{anode}) = E(\text{anode}) - i(\text{anode}) \times R(\text{anode})/1000 \quad (2)$$

$$E'(\text{cell}) = E'(\text{cathode}) - E'(\text{anode}) \quad (3)$$

$$P = E'(\text{cell}) \times i \quad (4)$$

Where E' is the ohmic-drop (iR-drop) corrected potential, E recorded raw potential value, i current, R value of iR drop, P power density. The raw data without correction were shown in Figure S4.

Cathode	SMOF-1	SMOF-2	SMOF-3	SCNT-1	SCNT-2	SCNT-3	Pt/C (JM)
iR-drop	0.97	0.93	1.10	0.50	0.50	0.78	0.79
Anode:	Pt/C	Pt/C	Pt/C	Pt/C	Pt/C	Pt/C	Pt/C (JM)
	(JM)	(JM)	(JM)	(JM)	(JM)	(JM)	
iR-drop	0.70	1.00	0.92	0.70	0.97	0.85	0.92

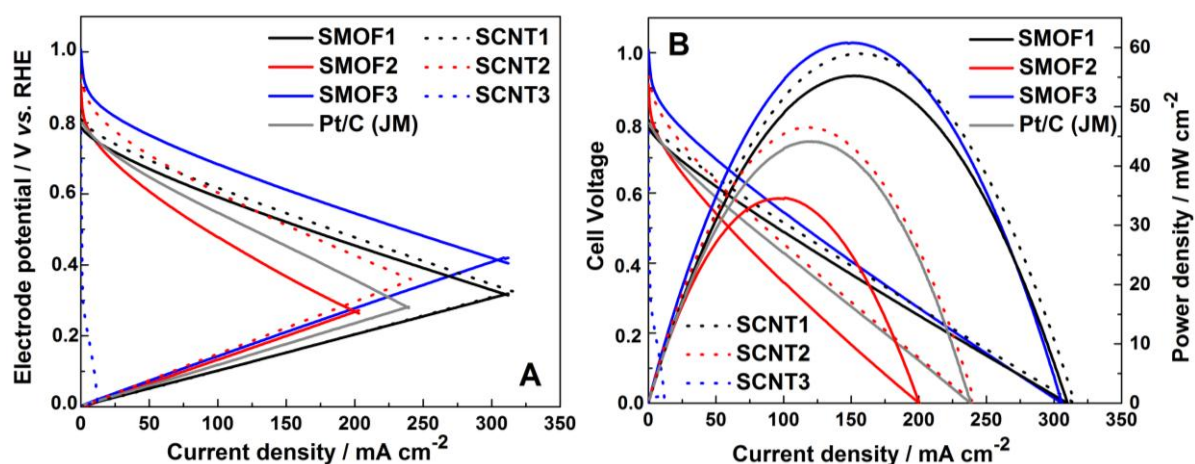


Figure S4. (A) Corresponding representative anode and cathode non-IR corrected polarization curves of a H_2/O_2 μ LFFC; and (B) cell voltage and power density curves. Pt/C (JM) catalyst was served as anode in all systems.