

Supporting information

The oxygen reduction reaction of ordered porous carbon-supported PtSn catalysts

Chin-Tien Shen^a, Kuan-Wen Wang^b, Chung-Jen Tseng^{a*}, Kan-Rong Lee^a, Yu-Jui
Hsueh^a

^a Department of Mechanical Engineering, National Central University, Taoyuan
32001, Taiwan

^b Institute of Materials Science and Engineering, National Central University,
Taoyuan 32001, Taiwan

*Corresponding author's name: Chung-Jen Tseng

Postal address: Department of Mechanical Engineering, National Central University,

No.300, Jhongda Rd., Jhongli District, Taoyuan City 32001, Taiwan

Telephone number: 886-3-4267348

Fax number: 886-3-4254501

E-mail address: cjtseng@ncu.edu.tw

Table S1 The d-spacing, Pt loading, surface Pt/Sn composition, grain size, I_{k085} and SA of Pt/C, Pt-Sn/C and Pt-Sn/OPC catalysts before and after ADT.

Sample	d-spacing (nm)	Pt loading (wt %)	Surface Pt/Sn composition	Grain size (nm)	I_{k085} (mA/cm ²)		SA (mA/cm ²)	
					fresh	1500	fresh	1500
Pt/C	0.2273	20.8	-	6.4	0.30	0.04	0.04	0.01
PtSn/C	0.2287	18.4	54/46	4.1	0.62	0.13	0.08	0.02
PtSn/OPC	0.2293	16.2	60/40	4.3	1.40	0.34	0.20	0.06

I_{k085} - the mixed kinetic-diffusion region (current density at E =0.85 V, I_{085})

SA - specific activity

Table S2 Comparison of mass activity of various PtSn/C catalysts.

Reference	Experimental procedure	Sample	Mass activity (mA mg ⁻¹ Pt)
			0.85 V
Reference 35	Bönnemann method	PtSn/C	13
Reference 36	Impregnation NaBH ₄ reduction method	PtSn/C	18
		Pt-Sn-300	22
		Pt-Sn-500	22
This study	Alcohol reduction method	PtSn/C	63
		PtSn/OPC	145

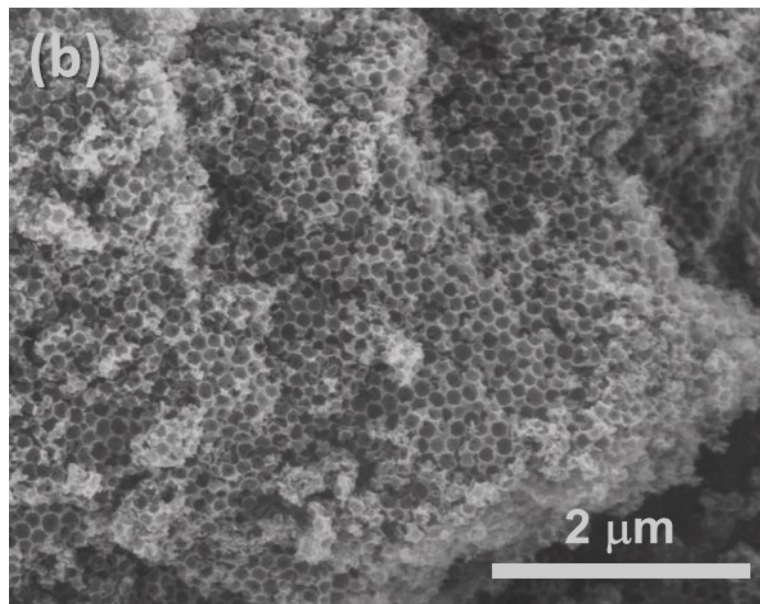
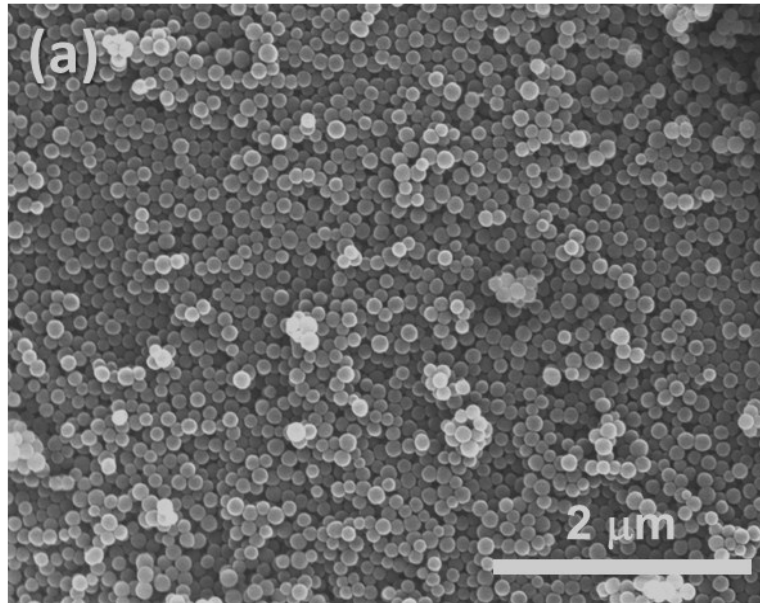


Figure S1 SEM images of (a) silica particle and (b) OPC.

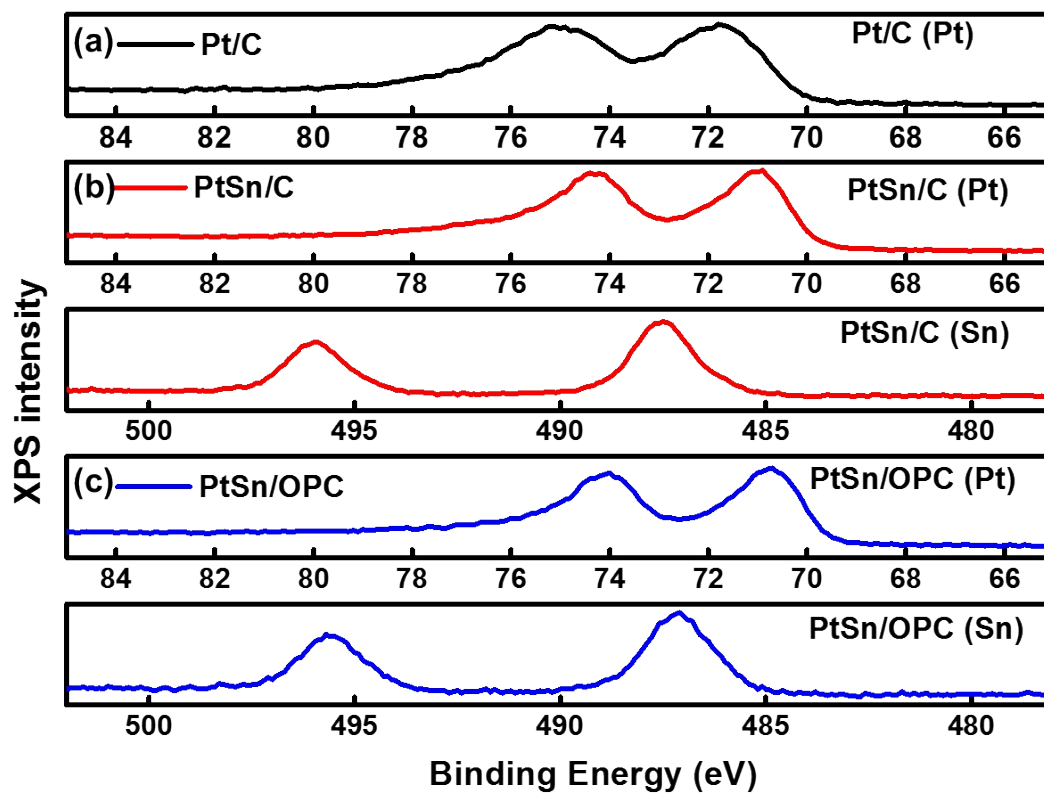


Figure S2 XPS spectra of as-prepared (a) Pt/C, (b) PtSn/C and (c) PtSn/OPC catalysts.

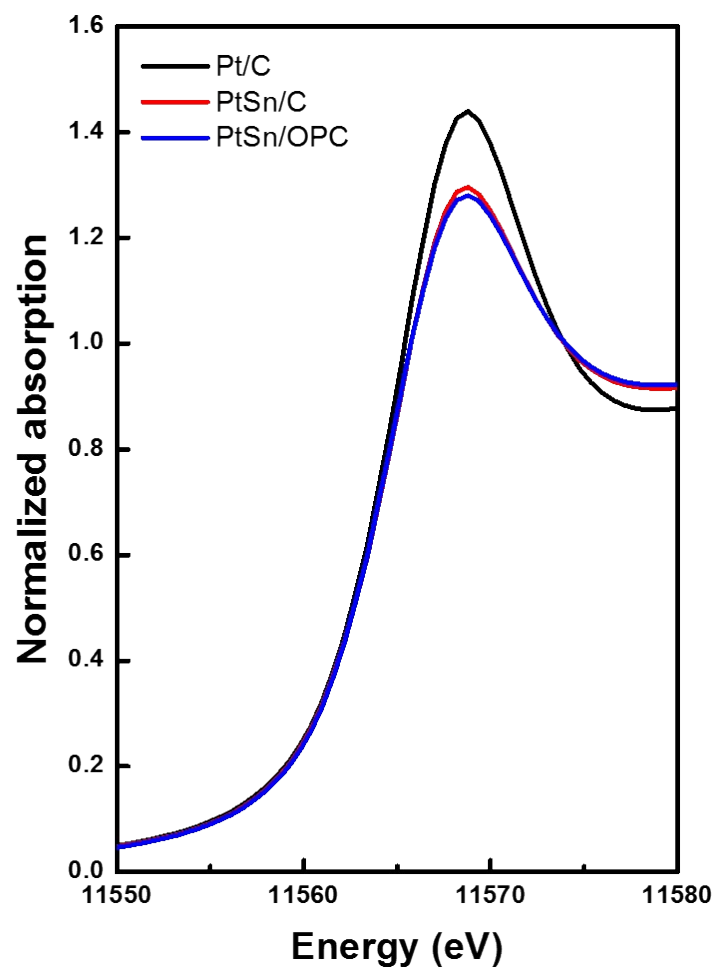


Figure S3 The XANES spectra at the Pt L_{III} edge for Pt/C, PtSn/C and PtSn/OPC catalysts.

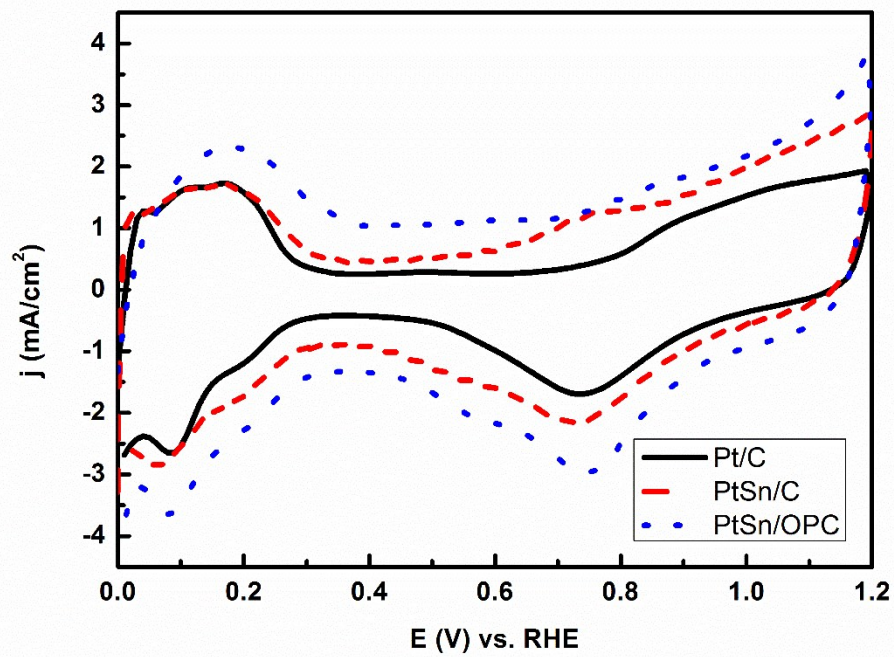


Figure S4 CV curves of Pt/C, PtSn/C and PtSn/OPC catalysts in 0.5 M H₂SO₄.

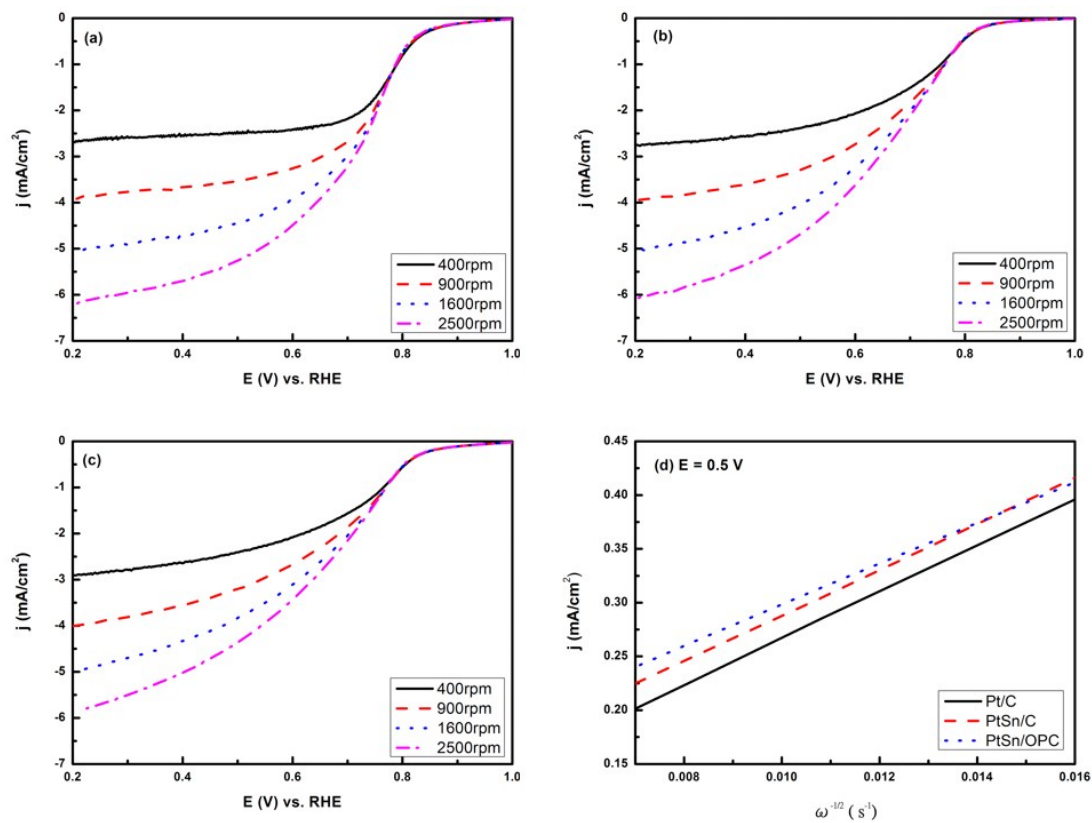


Figure S5 (a) Pt/C, (b) PtSn/C, and (c) PtSn/OPC catalysts recorded at different rotation rates (400-2500 rpm) in O₂ saturated 0.5M H₂SO₄ aqueous solution with a scan rate of 5 mVs⁻¹, and (d) the Koutecky-Levich plot at E = 0.5 V.

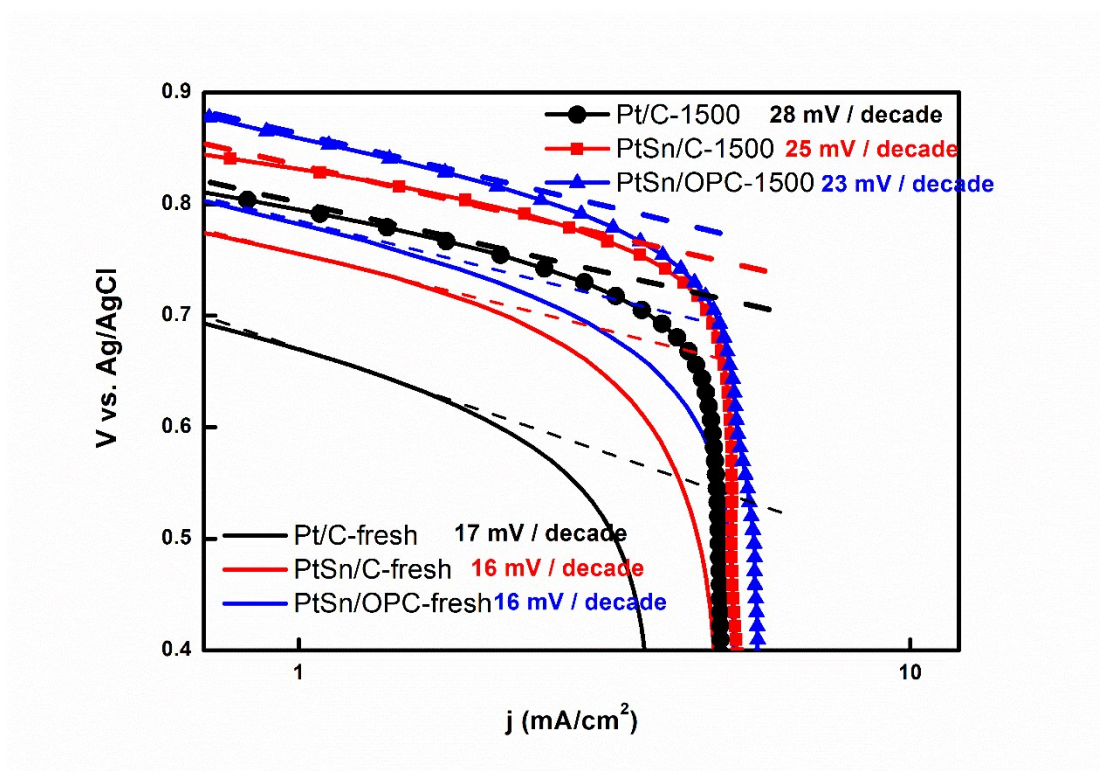


Fig. S6 Tafel plot of Pt/C, PtSn/C, PtSn/OPC catalysts in 0.5 M H₂SO₄ with O₂ at 1600 rpm before and after ADT tests.

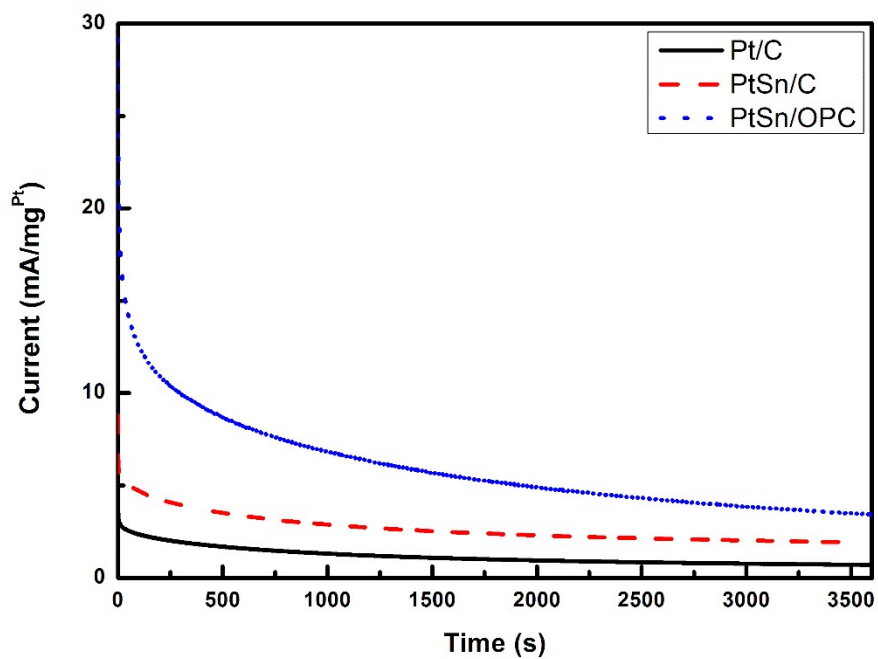


Fig. S7 CA curves of Pt/C, PtSn/C and PtSn/OPC catalysts recorded at 0.6 V (v.s. Ag/AgCl) in O₂-saturated 0.5M H₂SO₄ solution, rotation rate: 1600 rpm.