Supplementary Materials

Co-Existence of Atomic Pt and CoPt Nanoclusters on Co/SnO_x Mix-Oxide Demonstrates an Ultra-High-Performance Oxygen Reduction Reaction Activity

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1. **ICP-OES results of CSPP NC.**

Table S1. The ICP-OES determined actual composition of CSPP NCs.

Sample	Composition (%)			
	Co	Sn	Pd	Pt
CSPP-RT/50/70	2.747	6.095	5.472	0.329

- The composition is same for all the CSPP NCs.

2. HRTEM Image of CSP Nanocatalyst.

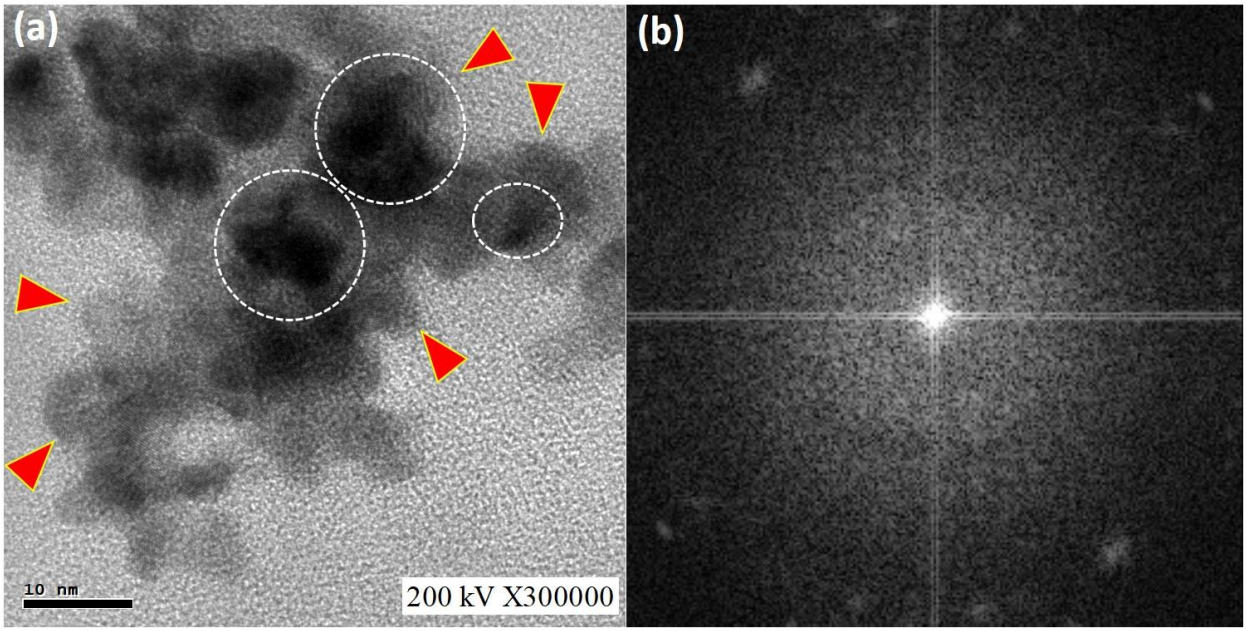

Figure S1. (a) The HRTEM image and (b) corresponding FFT pattern of CSP nanocatalyst.

3. The XRD Patterns of control samples.

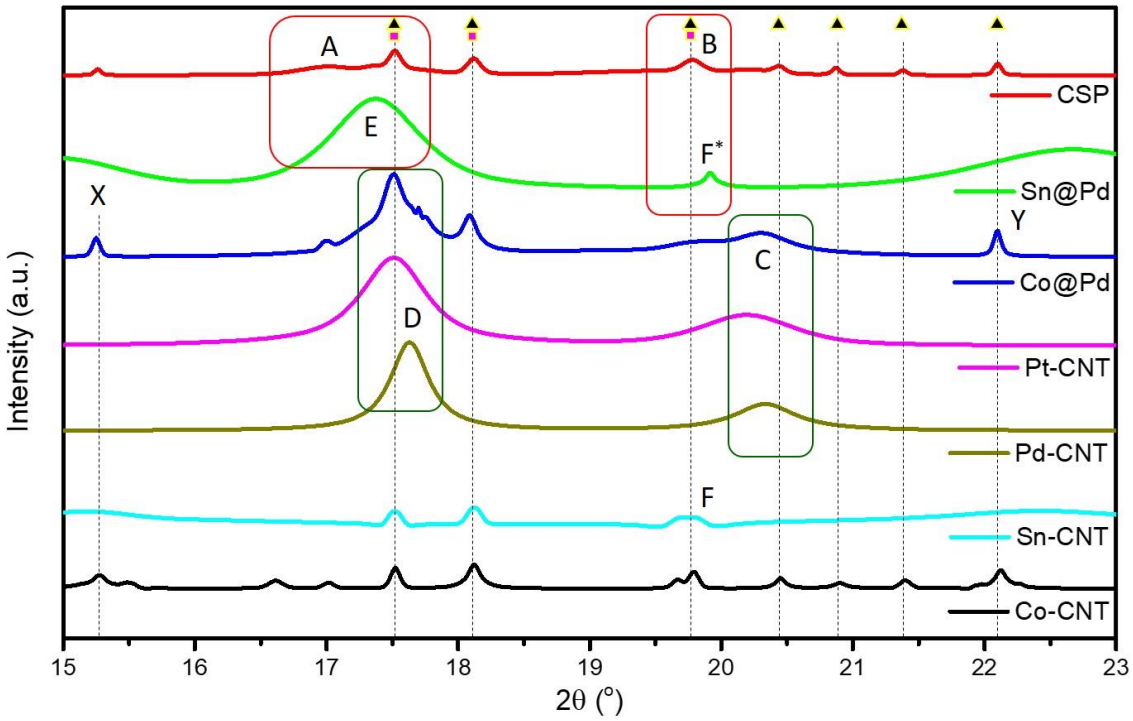

Figure S2. The XRD patterns of control samples.

Table S2. XRD determined average particle size of experimental NCs.

Sample	Component	2θ position (°)	FWHM	Average size (nm)
Pd-CNT	Pd (111)	17.63	0.511	6.94
Pt-CNT	Pt (111)	17.50	0.864	4.11
Sn@Pd	SnPd alloy	17.40	1.040	3.41
CSPP-RT	SnO_2 phase	17.53	0.072	47.56
CSPP-50	CoPt (110)	20.87	0.070	50.96
	CoPt (002)	21.05	0.090	39.65
	SnO_2 phase	17.49	0.084	42.26
CSPP-70	SnO_2 phase	15.54	0.071	47.96

4. Electrochemical parameters of experimental NCs

Table S3. Electrochemical parameters of experimental NCs

Sample	N (0.5 V)	ECSA ($cm^2 mg_{Pd+Pt}^{-1}$)	V_{oc} (V)	$E_{1/2}$ (V)	J_K^o (0.85 V)	J_K^c (0.85 V)	M.A. $_{(0.85V)}^{Pt/Pd}$ (mA/mg)	S.A.$_{(0.85V)}$ (mA cm^{-2})
CSP	3.24		0.896	0.834	1.95	1.95	36.30	
CSPP-RT	4.39	111.6	0.913	0.867	5.23	3.28	1669	0.523
CSPP-50	3.85	110	0.946	0.894	10.46	8.51	4330	1.045
CSPP-75	3.21	97.7	0.860	0.810	1.55	N/A	N/A	0.219

* For CSPP NCs, J_k^{c} $_{(0.85\ V)}$ is calculated by deducing the contribution of the J_K^{o} $_{(0.85\ V)}$ of CSP from that of CSPP NCs. The J_k^{c} $_{(0.85\ V)}$ is used for calculating the mass activities of experimental NCs.

5. Electrochemical results of CSPP NCs compared with CSP NC

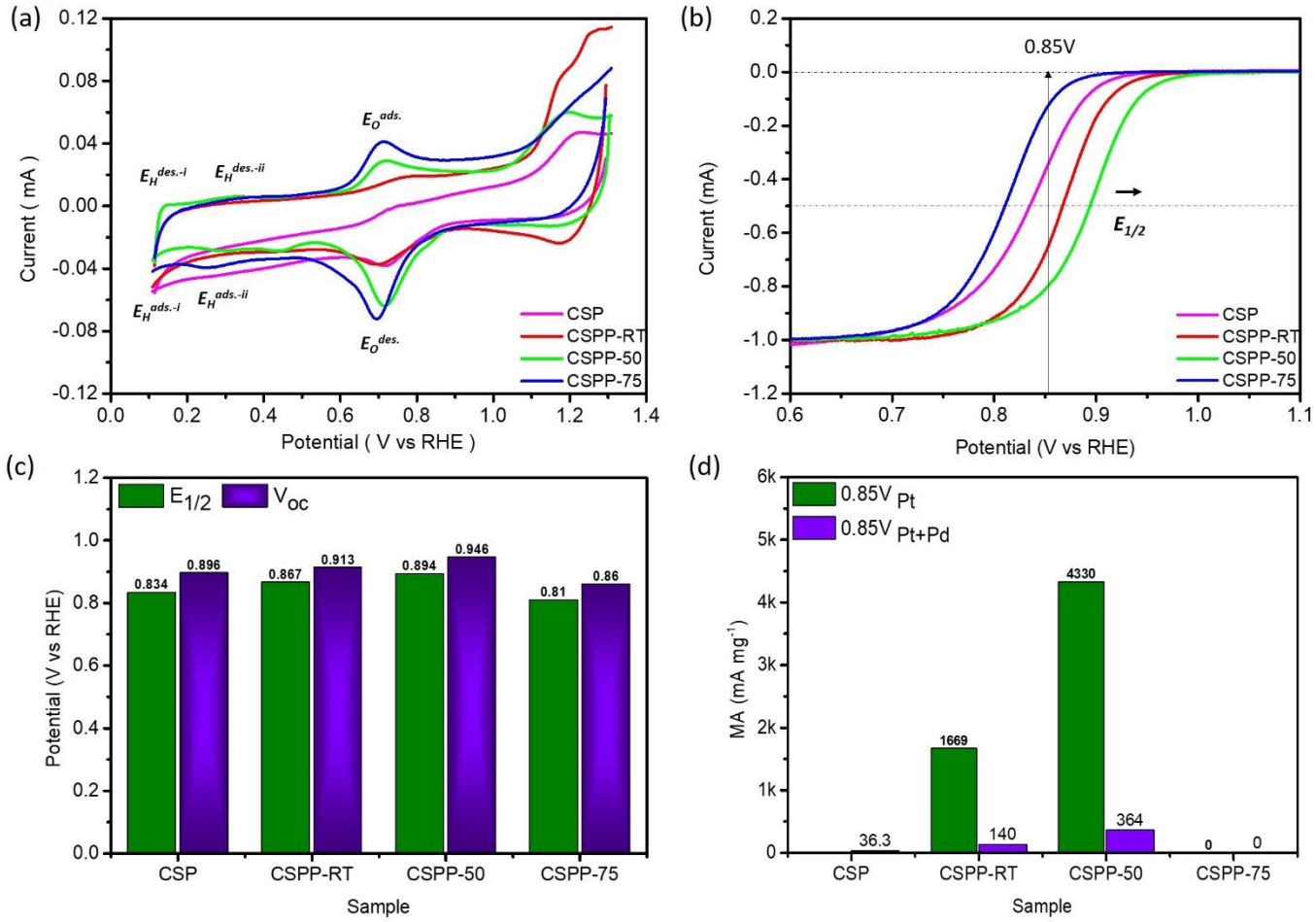

Figure S3. Electrochemical results of CSPP NCs compared with CSP NC. (a) CV and (b) LSV curves of CSPP-RT, CSPP-50 and CSPP-75 NCs compared with reference sample (CSP). (c) Onset potential (Voc)/half wave potential ($E_{1/2}$) and (d) ORR mass activity of CSPP NCs compared with commercial J.M.-Pt/C NCs.