SUPPLEMENTARY INFORMATION

Single and Polycrystalline CeO_2 Nanorods as Oxygen–Electrode Materials for Lithium–Oxygen Batteries

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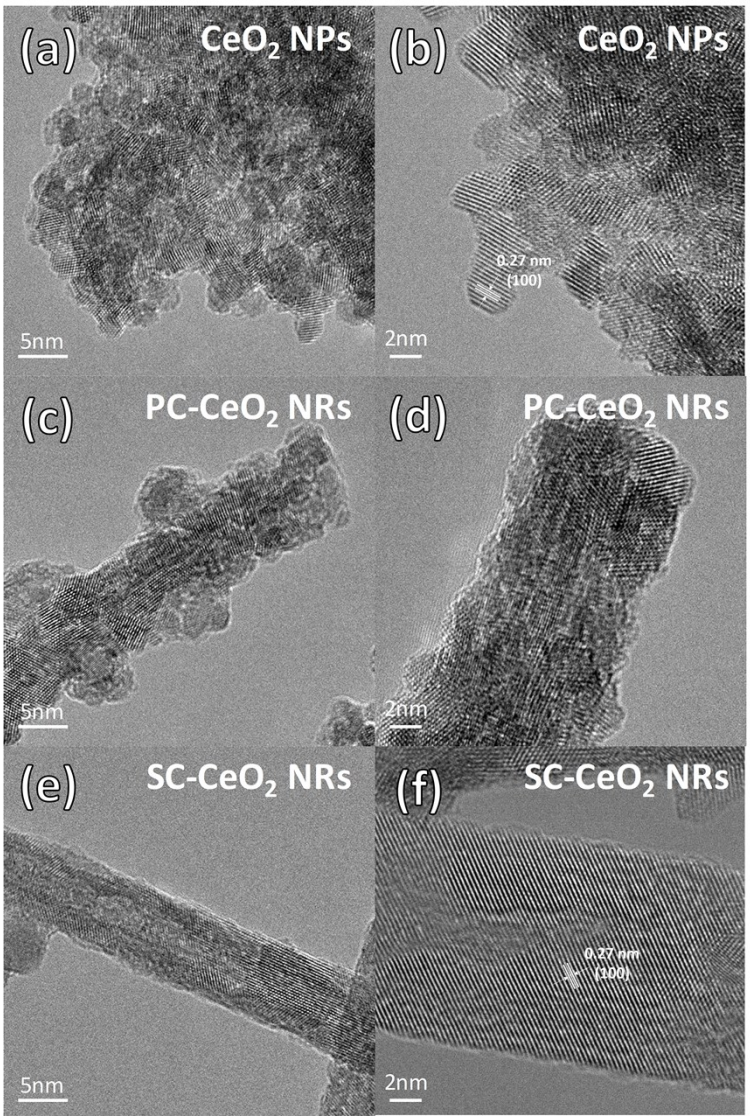


Fig. S1 TEM image of (a, b) CeO_2 NPs at the beginning of the reaction (0h), (c, d) PC-CeO_2 NRs at the reaction time of 0.5h, and (e, f) SC-CeO_2 NRs at the reaction time of 1h.

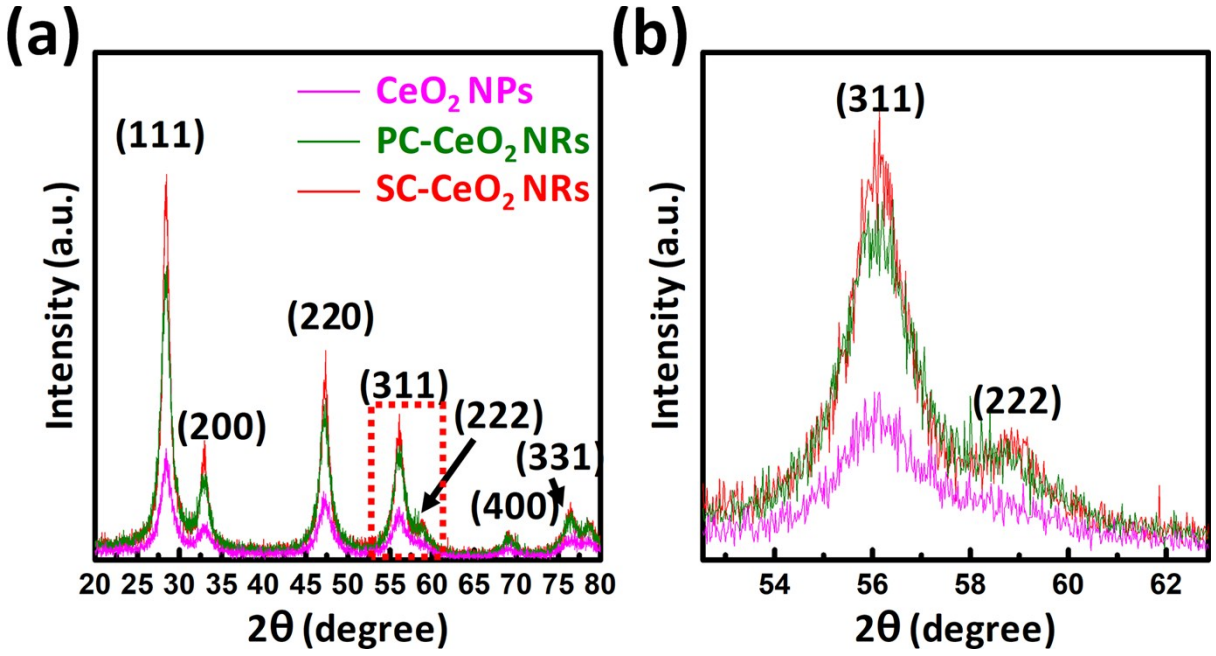


Fig. S2 (a) XRD patterns of CeO_2 NPs (t = 0h), PC-CeO_2 NRs (t = 0.5h) and SC-CeO_2 NRs (t = 1h). (b) Magnified XRD patterns of red rectangle in (a).

Table S1. The degree of preferential orientation for CeO_2 materials from the XRD patterns.

	Intensity (311)	**Intensity (222)**	$\mathbf{I_{(311)} / I_{(222)}}$
0h	58.4	22.3	2.6
0.5h	142.0	46.3	3.1
1h	174.0	46.3	3.8

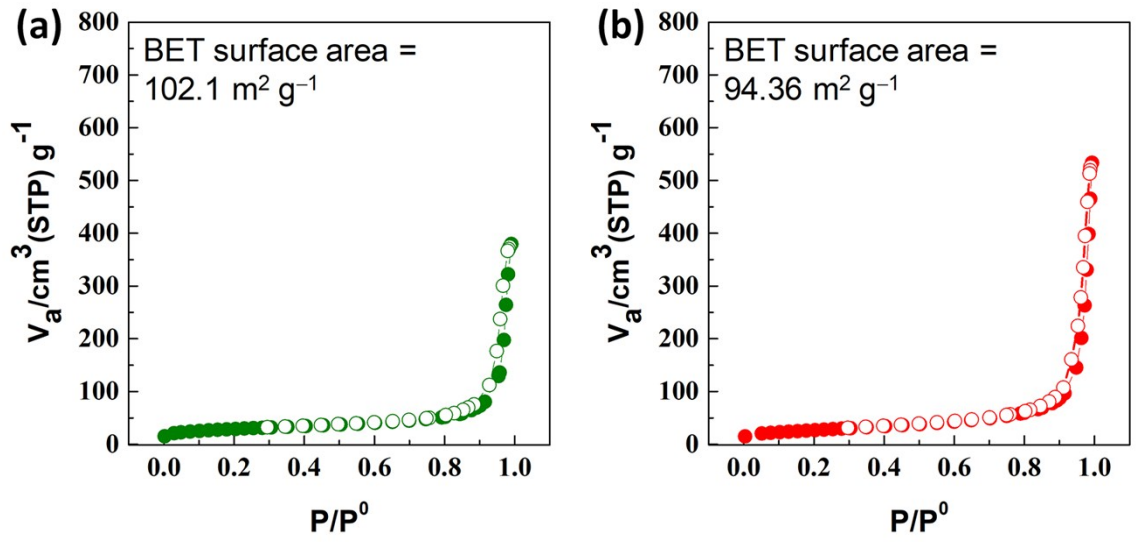


Fig. S3 N_2 adsorption-desorption curves for (a) PC-CeO_2 and (b) SC-CeO_2 NRs.

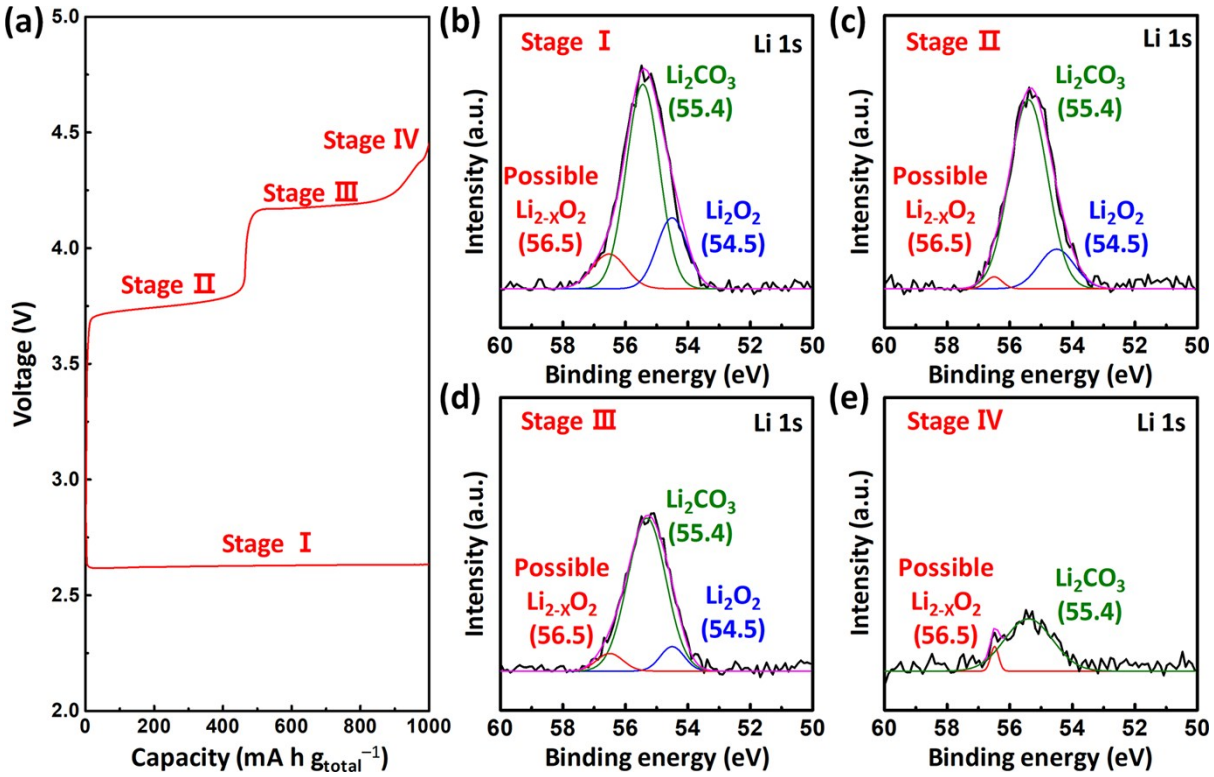


Fig. S4 (a) 1st discharge-charge curve of SC-CeO_2 NR at a current rate of 500 mA g^{-1}. (b-e) Li 1s XPS spectra of SC-CeO_2 NR at different stages in the 1st cycle, corresponding to stage Ⅰ-Ⅳ in (a), respectively.

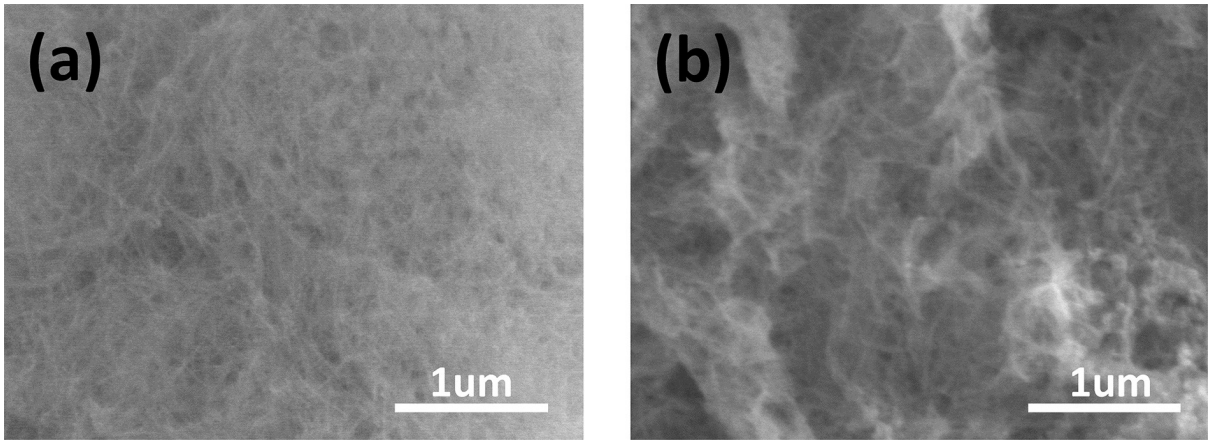


Fig. S5 FESEM images of (a) discharged and (b) charged SC-CeO_2 NR electrodes.

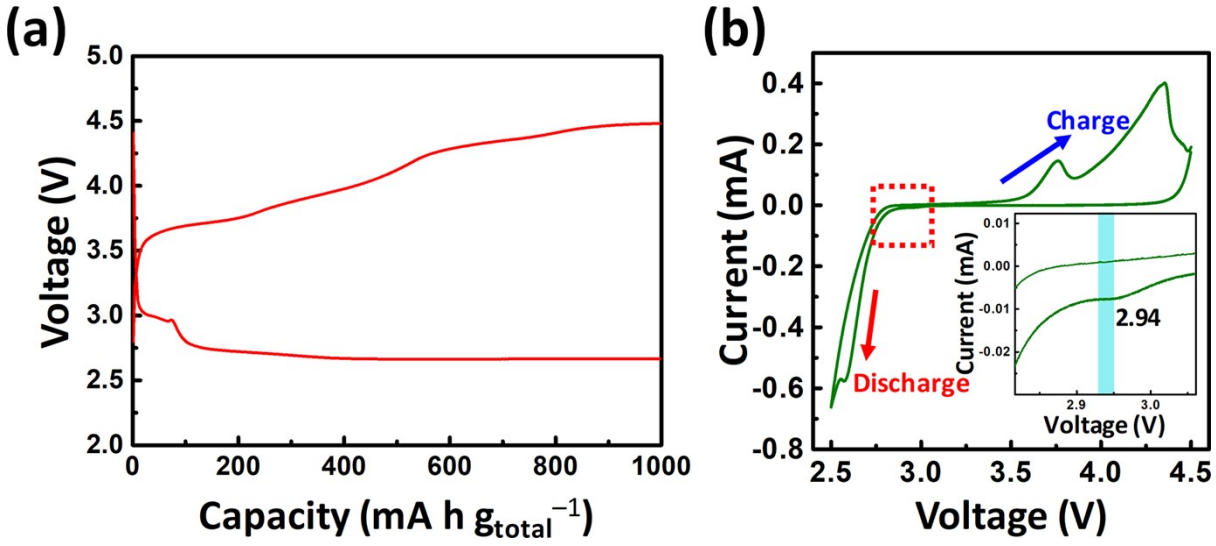


Fig. S6 (a) 50th cycle discharge–charge curves of SC-CeO_2 NR at a current rate of 500 mA g^{-1} and (b) CV curve for SC-CeO_2 NR at 3rd cycle.

Table S2 RC equivalent circuit model and fitting values of PC-CeO_2 NR and SC-CeO_2 NR electrodes.

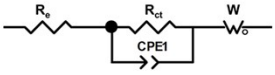
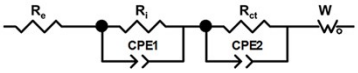
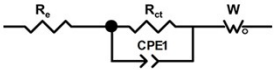
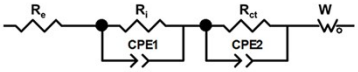
Electrode	Cycle	RC equivalent circuit model	R_e (Ω mg^{-1})	R_i (Ω mg^{-1})	R_{ct} (Ω mg^{-1})
PC-CeO_2 NRs	OCV		47.2	-	3666.9
	Charge		37.0	3450.4	61347.0
SC-CeO_2 NRs	OCV		37.0	-	2132.1
	Charge		34.6	704.0	16461.9

Table S3 Comparison of the present work with CeO_2 electrocatalysts for LOBs.

Reference	Material	Current rate	Voltage gap @500 mA h g^{-1} (V)	1st discharge capacity (mA h g^{-1})
Our work	SC-CeO_2 NRs	500 (mA g^{-1}), 0.16 (mA cm^{-2})	1.53	16300
[20]	NP-CeO_2	0.05 (mA cm^{-2})	-	2128
[31]	$Ce_{0.8}Zr_{0.2}O_2$	80 (mA g^{-1})	-	1620
[32]	$LaFe_{0.5}Mn_{0.5}O_3$-CeO_2	100 (mA g^{-1})	-	4700
[33]	GNS/ZDC	0.2 (mA cm^{-2})	1.77	3254
[34]	CeO_2/δ-MnO_2	200 (mA g^{-1})	1.42	8260
[35]	CeO_2@RGO	400 (mA g^{-1}),	1.02 (1000 mA g^{-1})	11900
[36]	Ag@CeO_2	100 (mA g^{-1})	-	3415
[37]	ZDC/carbon	0.2 (mA cm^{-2})	1.65	8435
[38]	CeO_2/CNT	20 (mA g^{-1})	-	2000