Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Facile electrochemical preparation of hierarchical porous structures to enhance manganese oxide charge-storage properties in ionic liquid electrolyte

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Table S1. Supercapacitive properties of the proposed hierarchical porous MnO_2 electrode in BMP–DCA IL compared to those of other nanostructured MnO_2/IL electrolyte combinations reported in the literature.

Electrode	Electrolyte	Maximum energy density (Wh/kg)	Maximum power density (kW/kg)	Ref.
3D mesoporous MnO_2@Si nanowires	$LiClO_4$/PMP–NTf_2	0.17 Wh/L [a]	16 W/L [a]	20
MnO_2@nanoporous Au	EMI–DCA	40	150 [b]	21
Asymmetrical nickel foam/CNT/Au/MnO_2 (positive)//activated carbon (negative)	BMI–PF_6/DMF	67.5	20.4	22
MnO_2 nanowires	$LiClO_4$/OZO quasi-IL	76 [c]	15.6 [c]	23
Macroporous manganese oxide film	Li^+/BMMI–NTf_2	29 [c]		24
Reduced graphene oxide/MnO_2/Ag nanowire	BMI–NTf_2 gel	2.3 Wh/L [a]	162 W/L [a]	25
Hierarchical porous MnO_2	BMP–DCA	90	43	This study

BMI: 1-butyl-3-methylimidazolium; BMMI: 1-butyl-2,3-dimethylimidazolium; BMP: N-butyl-N-methylpyrrolidinium; DCA: dicyanamide; DMF: N,N-dimethylformamide; EMI: 1-ethyl-3-methylimidazolium; NTf_2: bis(trifluromethylsulfonyl)imide; OZO: 2-oxazolidinone; PMP: 1-methyl-1-propylpyrrolidinium.

[a] calculated based on volume. [b] based on a different calculation method.
[c] calculated from the provided data.

Table S2. The E_0 values of hierarchical porous MnO_2 and flat MnO_2 electrodes derived from the XAS spectra shown in Figure 3.

Potential	E_0 (eV)	
	Porous MnO_2	Flat MnO_2
-2.2 V (step 1)	6549.2	6550.1
+0.8 V (step 2)	6551.6	6550.9
-2.2 V (step 3)	6549.2	6550.2

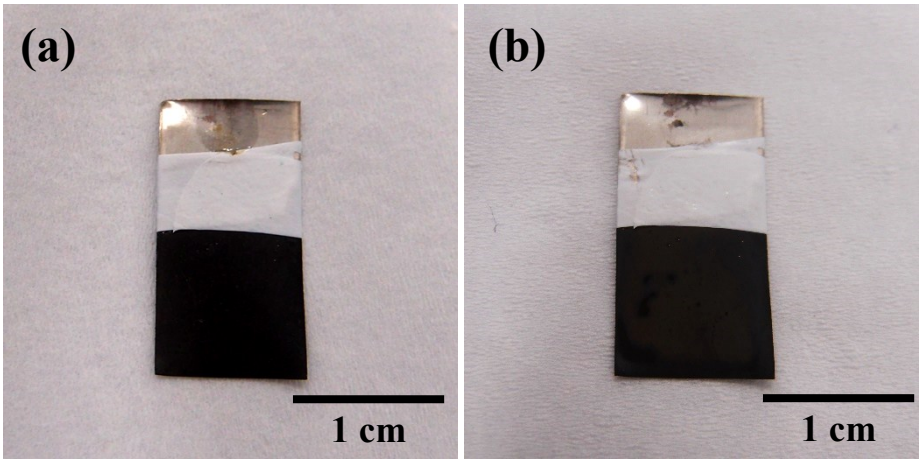

Figure S1. Photos of the porous Ni electrodes (a) without and (b) with deposited MnO_2.

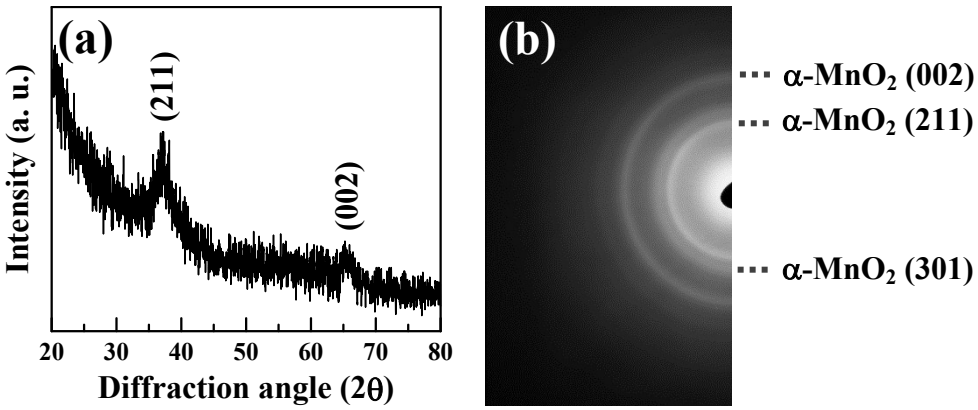

Figure S2. (a) X-ray diffraction pattern and (b) electron diffraction pattern of deposited Mn oxide.

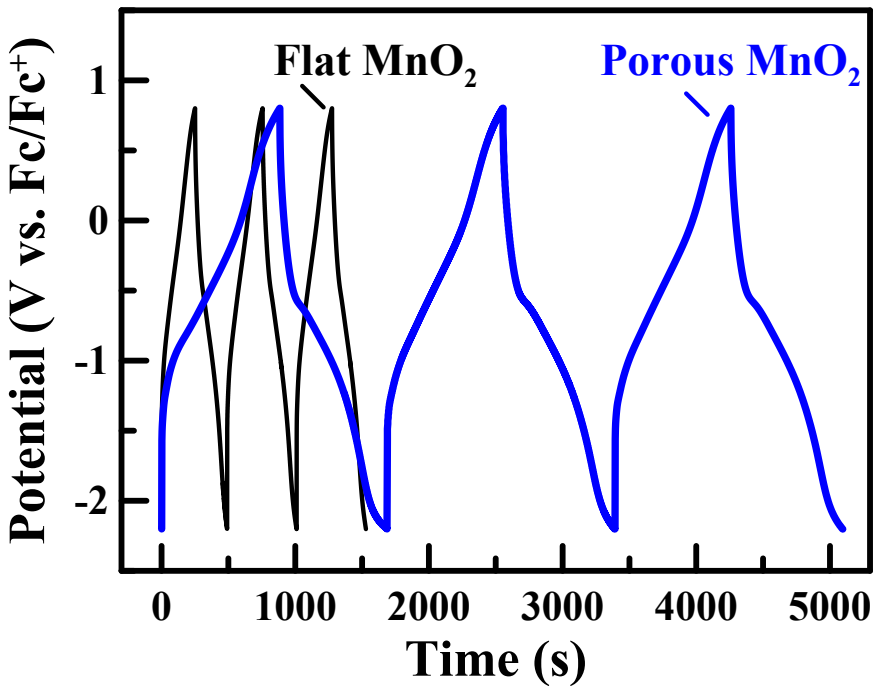

Figure S3. Chronopotentiograms of hierarchical porous MnO_2 electrode and flat MnO_2 electrode recorded in the three-electrode cell. The applied current density was ±1.0 A g^{-1}.

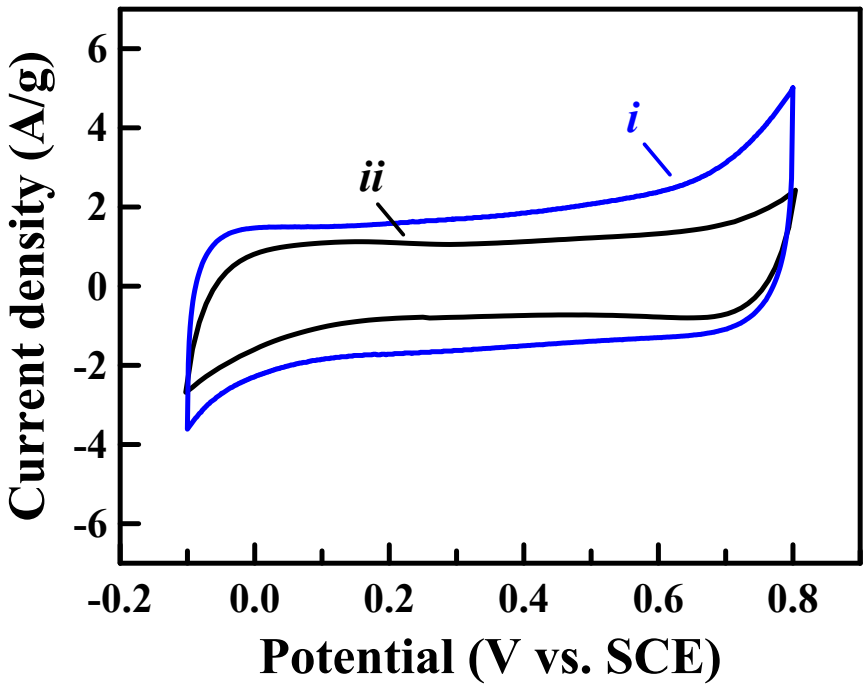

Figure S4. CV curves of hierarchical porous MnO_2 electrode (curve *i*) and flat MnO_2 electrode (curve *ii*) measured in aqueous Na_2SO_4 electrolyte with a potential sweep rate of 5 mV s^{-1}.

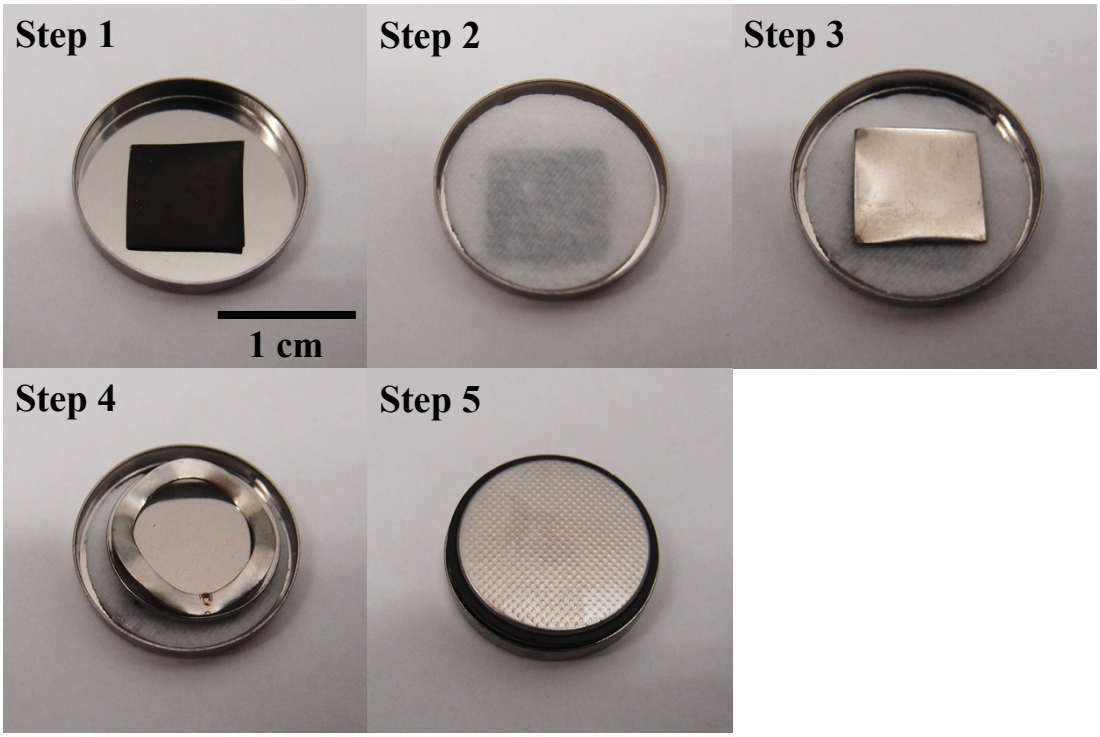

Figure S5. Photos of two-electrode symmetric cell assembly.