

Supplementary material

One-pot spray engineering to design Na_{0.44}MnO₂ cathode electrodes for high-rate and cycle-stable Na-ion battery

Bon-Ryul Koo^a, Young-Geun Lee^b, Sang Ho Lee^c, Geon-Hyoung An^{b,d,**}, Chun Huang^{e,f,g,a*}

^aDepartment of Materials, University of Oxford, Parks Road, Oxford, OX1 3PH, UK

^bDepartment of Energy Engineering, Future Convergence Technology Research Institute, Gyeongsang National University, 33 Dongjin-ro, Jinju, Gyeongnam 52828, Republic of Korea

^cDepartment of Chemical Engineering, Pukyong National University, Busan 48513, South Korea

^dDepartment of Energy System Engineering, Gyeongsang National University, 33 Dongjin-ro, Jinju, Gyeongnam 52828, Republic of Korea

^eDepartment of Materials, Imperial College London, London, SW7 2AZ, UK

^fThe Faraday Institution, Quad One, Becquerel Ave, Harwell Campus, Didcot, OX11 0RA, UK

^gResearch Complex at Harwell, Rutherford Appleton Laboratory, Didcot, OX11 0FA, UK

^{**}Corresponding author.

E-mail address: ghan@gnu.ac.kr (G.-H. An)

^{*}Corresponding author.

E-mail address: a.huang@imperial.ac.uk (C. Huang)

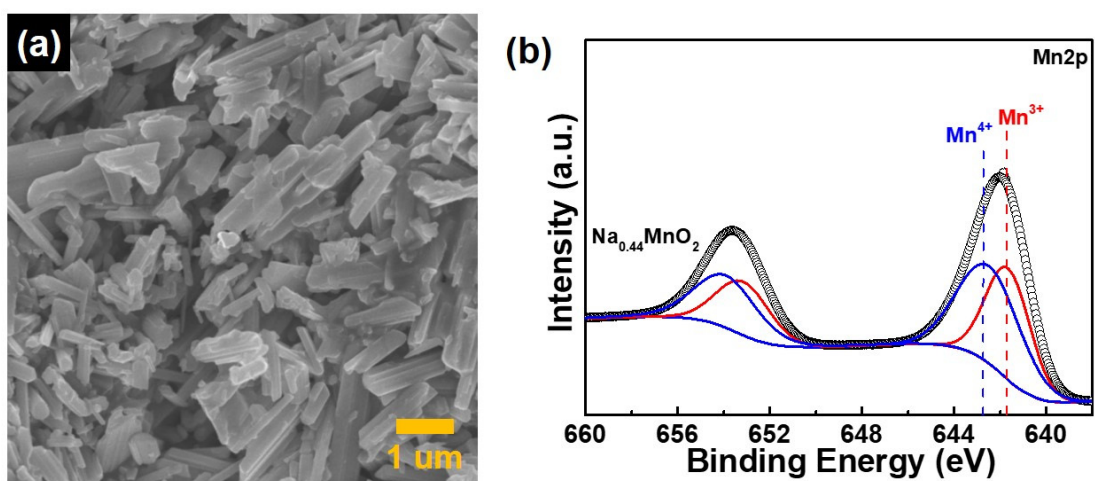


Figure S1. (a) SEM image and Mn 2p XPS spectra of $\text{Na}_{0.44}\text{MnO}_2$ nanorods formed by sol-gel method.

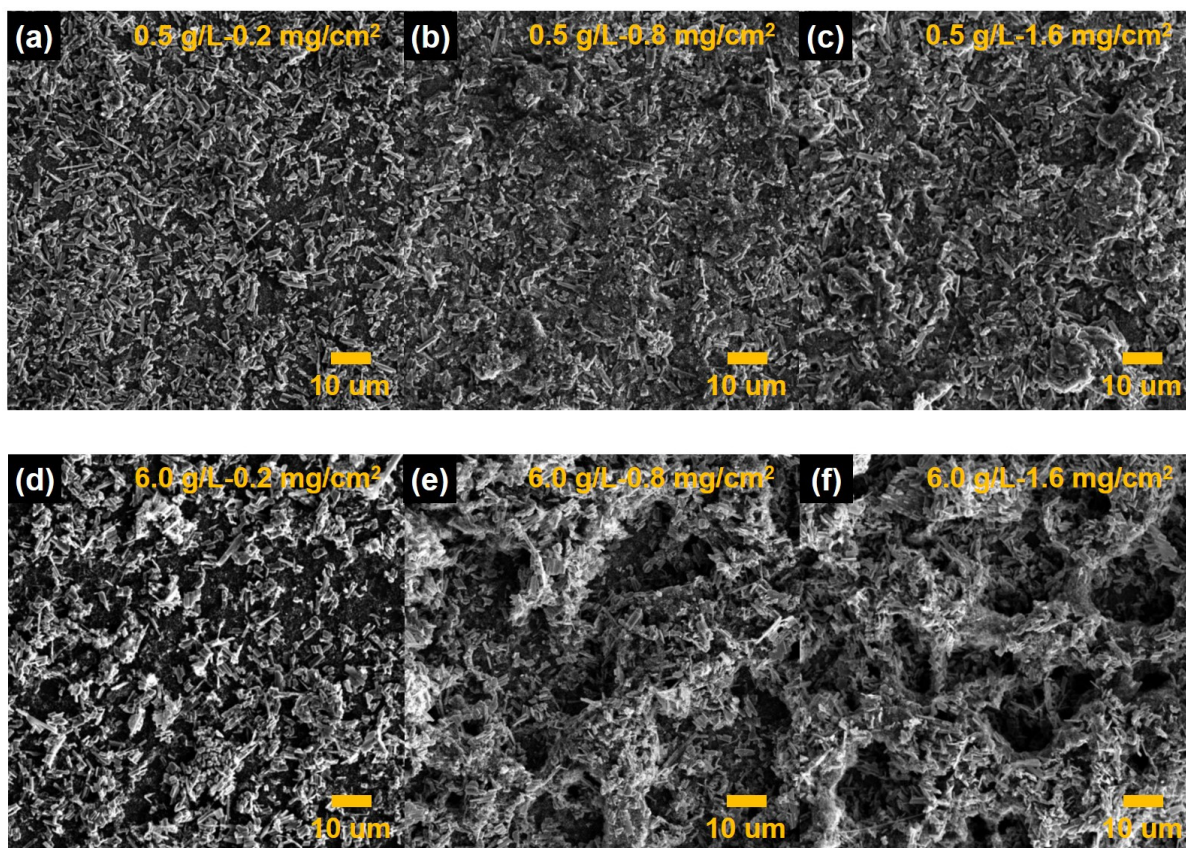


Figure S2. Comparison of surface morphology between 0.5 g/L and 6.0 g/L electrodes as increasing loading densities from 0.2 to 1.6 mg/cm².

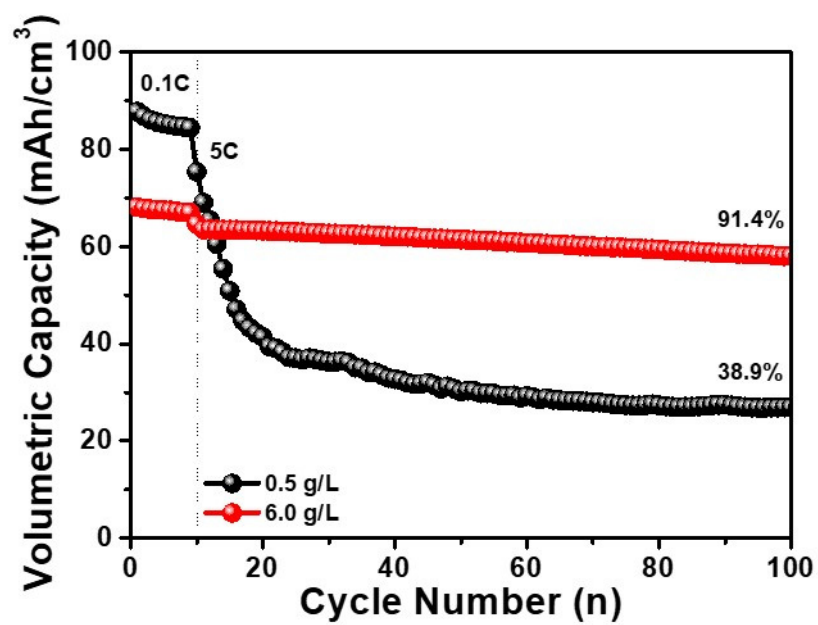


Figure S3. Cycling performances in volumetric capacity of 0.5 g/L and 6.0 g/L electrodes traced in voltage range of 1.5–4.3 V at 0.1 C for the first 10 cycles and at 5 C for the rest of the cycles.

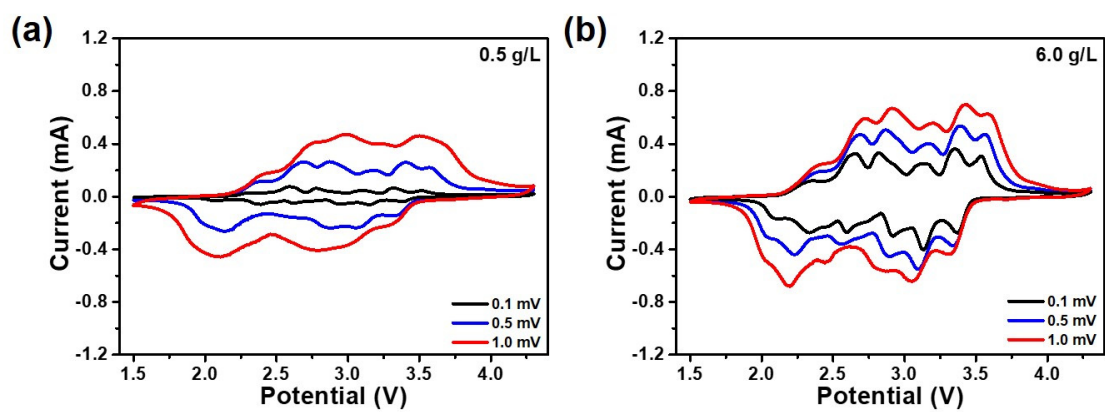


Figure S4. CV curves of (a) 0.5 g/L and (b) 6.0 g/L electrodes recorded at various scan rates of 0.1, 0.5, and 1.0 mV.

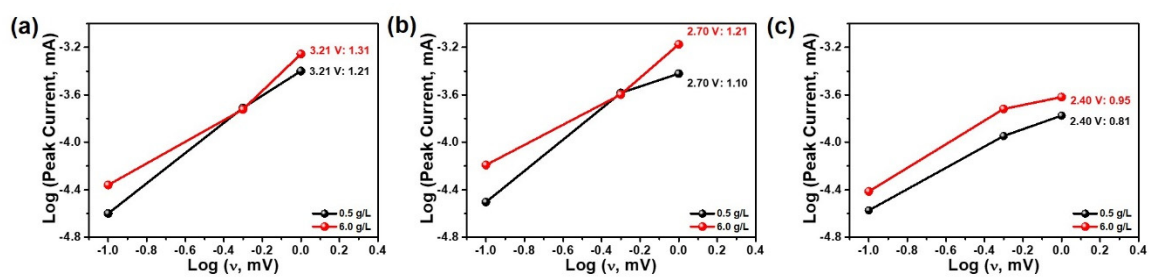


Figure S5 Log i –log v plot of 0.5 g/L and 6.0 g/L electrodes in various specific voltage ((a) 3.21 V, (b) 2.71 V, and (c) 2.40 V).

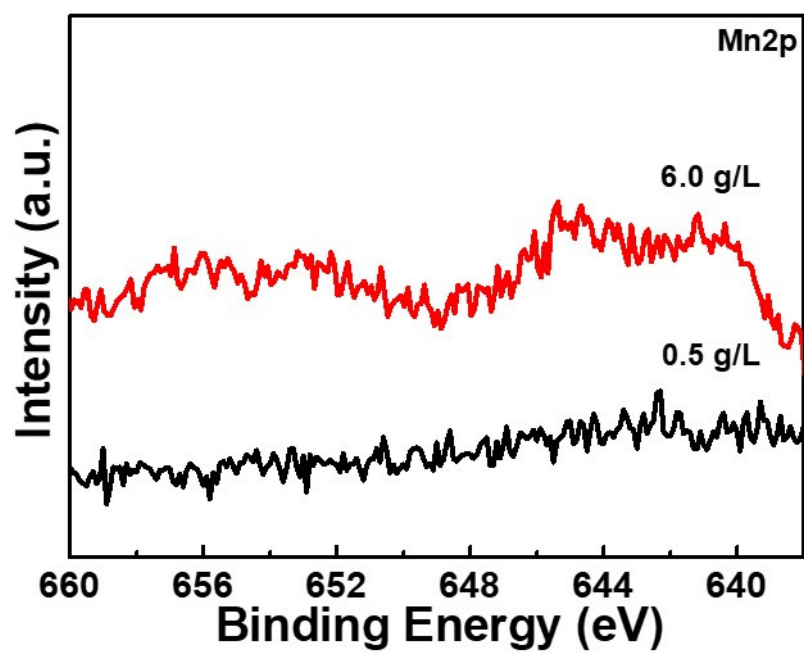


Figure S6. Mn 2p XPS spectra of 0.5 g/L and 6.0 g/L electrodes after 100 cycling at 5 C-rate.

Table S1. Na-ion Diffusion coefficient of all electrodes measured at the specific potentials.

Samples	D [cm ² /s]			
	Anodic 3.3-3.5 V	Anodic 2.7-3.0 V	Cathodic 3.0-3.2 V	Cathodic 2.1-.2.4 V
0.5 g/L electrode	4.02×10^{-6}	3.05×10^{-6}	4.54×10^{-6}	2.55×10^{-6}
4.0 g/L electrode	8.72×10^{-6}	7.27×10^{-6}	5.27×10^{-6}	5.81×10^{-6}
6.0 g/L electrode	9.88×10^{-6}	8.99×10^{-6}	7.29×10^{-6}	8.82×10^{-6}
8.0 g/L electrode	8.97×10^{-6}	8.09×10^{-6}	7.05×10^{-6}	7.67×10^{-6}