Electronic supplementary information

Li^+-conductive Li_2SiO_3 stabilized Li-rich layered oxide with *in-situ* formed spinel nano-coating layer: toward enhanced electrochemical performance for lithium-ion batteries

Mingquan Xu, [a] Qingwang Lian, [a] Yuxin Wu, [a] Cheng Ma, [a] Pengfei Tan, [a] Qingbing Xia, [a] Jinfang Zhang, [a] Douglas G. Ivey [b] and Weifeng Wei [*a]

[a] State key Laboratory of Powder Metallurgy, Central South University, Changsha, 410083, P. R. China. E-mail: weifengwei@csu.edu.cn; Fax: +86 73188877876; Tel: +86 83188877876
[b] Department of Chemical and Materials Engineering, University of Alberta, Edmonton, AB T6G 2V4, Canada

Fig. S1 Powder XRD patterns of the pristine and LS-6% samples (Li_2SiO_3 indicated by black asterisk).

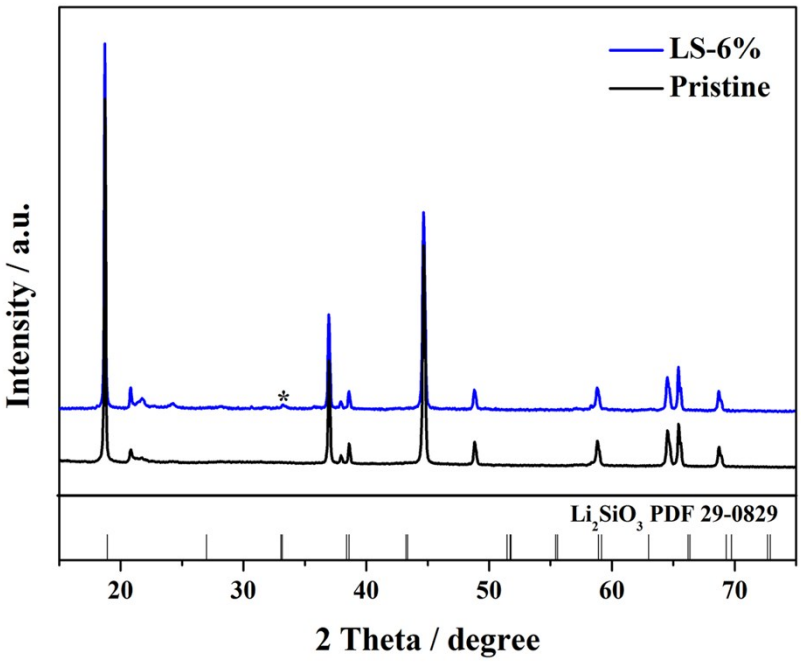
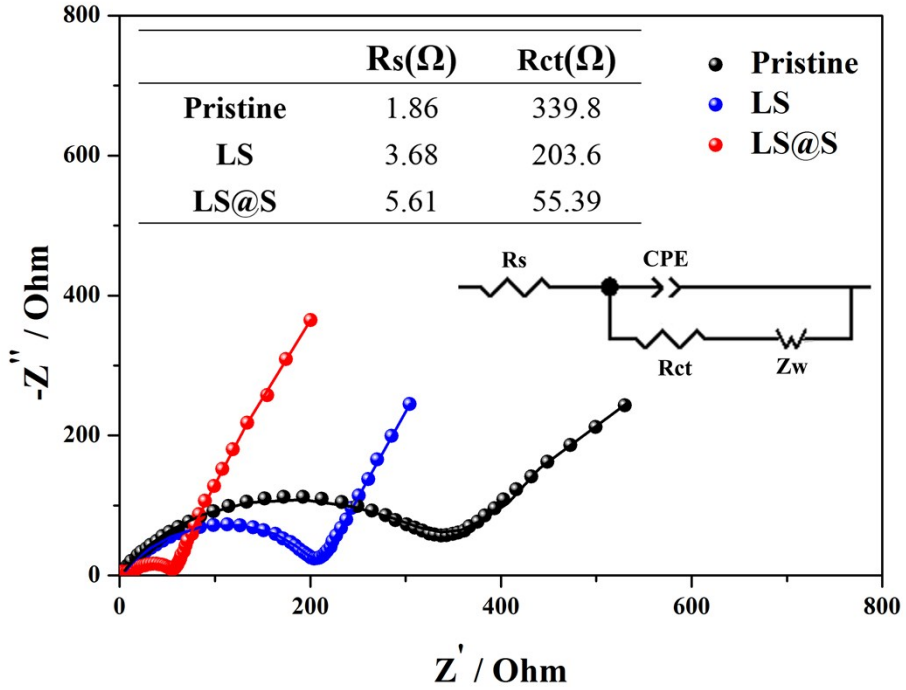


Fig. S2 EIS plot of the pristine, LS, and LS@S sample after activated at 0.1 C for 3 cycles (dots denote the experimental data, lines denote the simulation results).



Note: Before the EIS test, all cells rested for 30 min after the end of the 3rd discharge process and the OCP was relaxed to approximately 2.8 V.

Fig. S3 CV curve for the LS@S sample for the initial three cycles.

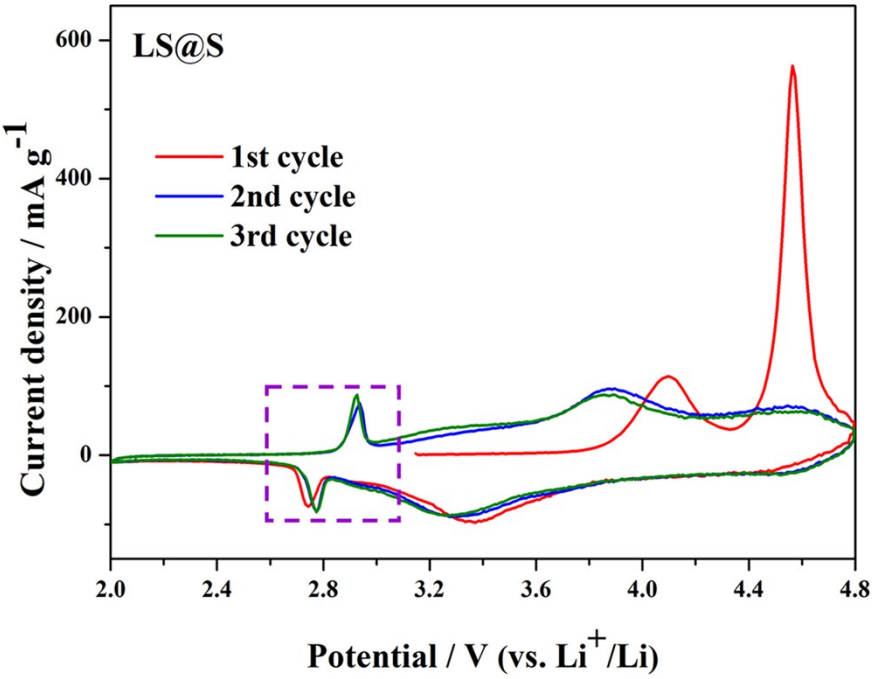


Table S1 comparing electrochemical charge-discharge profiles of Li-rich layered oxides and other cathode materials

materials	voltage range / V	redox couple	redox potential / V
Li-rich layered oxides (our work)	2-4.8	Ni^{2+}/Ni^{4+}, Co^{3+}/Co^{4+}, Mn^{3+}/Mn^{4+}	2.94/2.77, 3.87/3.32, 4.55/4.51
$LiCoO_2$ [1]	2.5-4.3	Co^{3+}/Co^{4+}	4.0/3.84
$Li(MMn_{11/6})O_4$ [2]	3.5-4.3	Mn^{3+}/Mn^{4+}	4.06/3.94, 4.18/4.07
$LiVPO_4F$ [3]	3.0-4.5	V^{3+}/V^{4+}	4.45/4.13
MOPOFs [4]	2.5-4.6	V^{4+}/V^{5+}	4.18/3.83
α_1-$LiVOPO_4$ [5]	2.5-4.5	V^{4+}/V^{5+}	4.17/3.75

References

1. K. S. Tan, M. V. Reddy, G. V. S. Rao and B. V. R. Chowdari, *J. Power Sources*, 2005, **147**, 241-248.
2. M. V. Reddy, A. Sakunthala, S. SelvashekaraPandian and B. V. R. Chowdari, *J. Phys. Chem. C*, 2013, **117**, 9056-9064.
3. M. V. Reddy, G. V. Subba Rao and B. V. R. Chowdari, *J. Power Sources*, 2010, **195**, 5768-5774.
4. M. Nagarathinam, K. Saravanan, E. J. H. Phua, M. V. Reddy, B. V. R. Chowdari and J. J. Vittal, *Angew. Chem., Int. Ed.*, 2012, **51**, 5866-5870.
5. A. Shahul Hameed, M. Nagarathinam, M. V. Reddy, B. V. R. Chowdari and J. J. Vittal, *J. Mater. Chem.*, 2012, **22**, 7206-7213.