

### Supporting information for

Constructing BaLi<sub>2</sub>Ti<sub>6</sub>O<sub>14</sub>@C nanofibers with low carbon content as high-performance anode materials for Li-ion batteries

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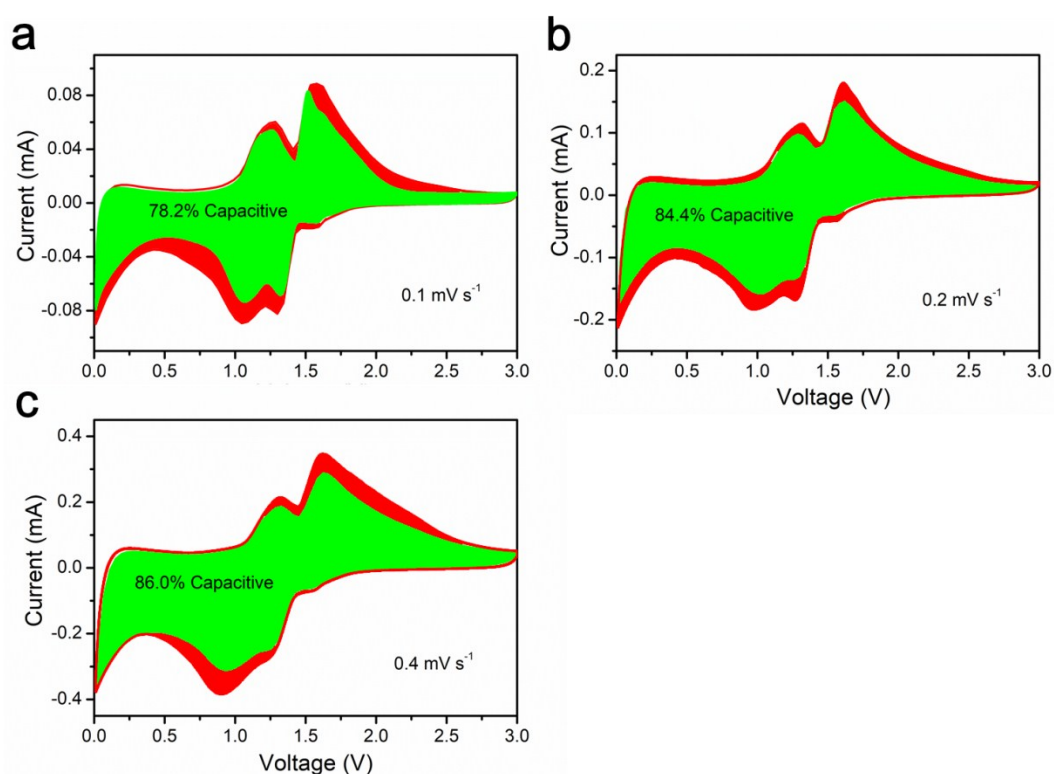


Fig. S1. CV curves and capacity contribution (green region) at 0.1, 0.2, 0.4 mV s<sup>-1</sup>

Table S1. Cycling stability comparison of MLi<sub>2</sub>Ti<sub>6</sub>O<sub>14</sub> (M=Ba, Sr, Pb, 2Na) reported in recent literatures.

Compound	Preparation	Morphology	Cycle performance	Reference
BaLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub> @C	Electrospinning	fibers	100 mA g <sup>-1</sup> , 300 cycles, 140.1 mAh g <sup>-1</sup> , 1000 mA g <sup>-1</sup> , 800 cycles, 95.032 mAh g <sup>-1</sup>	This work

BaLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub> @Ag	Solid-state method	particles	100 mA g <sup>-1</sup> , 100 cycles, 117.0 mAh g <sup>-1</sup>	1
BaLi <sub>1.9</sub> Mg <sub>0.1</sub> Ti <sub>6</sub> O <sub>14</sub>	Solid-state method	particles	1000 mA g <sup>-1</sup> , 200 cycles, 90.1 mAh g <sup>-1</sup>	2
BaLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Solid-state reaction process	particles	100 mA g <sup>-1</sup> , 100 cycles, 109 mAh g <sup>-1</sup>	3
BaLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Electrospinning	fibers	100 mA g <sup>-1</sup> , 10 cycles, 133.7 mAh g <sup>-1</sup>	4
BaLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Energy-savvy auto-combustion	particles	726 mA g <sup>-1</sup> , 10 cycles, 55 mAh g <sup>-1</sup>	5
BaLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Sol-gel synthesis	particles	10 mA g <sup>-1</sup> , 50 cycles, 120 mAh g <sup>-1</sup>	6
SrLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Sol-gel synthesis	particles	10 mA g <sup>-1</sup> , 50 cycles, 92 mAh g <sup>-1</sup>	6
SrLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Template method	particles	100 mA g <sup>-1</sup> , 100 cycles, 102 mAh g <sup>-1</sup>	7
SrLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Solid-state reaction	particles	158 mA g <sup>-1</sup> , 1000 cycles, 100.2 mAh g <sup>-1</sup>	8
SrLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Solid-state reaction	particles	50 mA g <sup>-1</sup> , 50 cycles, 155.9 mAh g <sup>-1</sup>	9
Sr <sub>0.95</sub> La <sub>0.05</sub> Li <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	Solid-state process	particles	100 mA g <sup>-1</sup> , 100 cycles, 159.54 mAh g <sup>-1</sup>	10

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$\text{SrLi}_2\text{Ti}_6\text{O}_{14}$	Solid-state synthesis	particles	0.05 C , 50 cycles, 115 mAh g <sup>-1</sup>	11
$\text{SrLi}_2\text{Ti}_6\text{O}_{14}@\text{C/N}$	Solid-state assisted solution method	particles	100 mA g <sup>-1</sup> , 150 cycles, 156.58 mAh g <sup>-1</sup>	12
$\text{SrLi}_2\text{Ti}_6\text{O}_{14}@\text{C/Ag}$	Solid-state assisted solution method	particles	100 mA g <sup>-1</sup> , 200 cycles, 151.2 mAh g <sup>-1</sup>	13
$\text{SrLi}_2\text{Ti}_6\text{O}_{14}/\text{Ag}$	Sol-gel method	particles	50 mA g <sup>-1</sup> , 50 cycles, 154.6 mAh g <sup>-1</sup>	14
$\text{PbLi}_2\text{Ti}_6\text{O}_{14}$	Solid state method	particles	100 mA g <sup>-1</sup> , 100 cycles, 147.9 mAh g <sup>-1</sup>	15
$\text{PbLi}_2\text{Ti}_6\text{O}_{14}$	Solid state method	particles	100 mA g <sup>-1</sup> , 100 cycles, 142.0 mAh g <sup>-1</sup>	16
$\text{PbLi}_2\text{Ti}_6\text{O}_{14}@\text{NC}$	Solid-state method	particles	500 mA g <sup>-1</sup> , 1500 cycles, 99.7 mAh g <sup>-1</sup>	17
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Electrospinning	fibers	100 mA g <sup>-1</sup> , 100 cycles, 116.49 mAh g <sup>-1</sup> , 1000 mA g <sup>-1</sup> , 800 cycles, 77.8 mAh g <sup>-1</sup>	18
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Sol-gel method		100 mA g <sup>-1</sup> , 60 cycles, 74 mAh g <sup>-1</sup>	19

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$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state method	particles	50 mA g <sup>-1</sup> , 50 cycles, 86.9 mAh g <sup>-1</sup>	20
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state method	particles	100 mA g <sup>-1</sup> , 50 cycles, 74 mAh g <sup>-1</sup>	21
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state method and Chemical deposition decomposition method	particles	100 mA g <sup>-1</sup> , 50 cycles, 94.2 mAh g <sup>-1</sup>	22
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state method	particles	100 mA g <sup>-1</sup> , 50 cycles, 75.2 mAh g <sup>-1</sup>	23
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Molten salt synthesis method	whiskers and particles	100 mA g <sup>-1</sup> , 200 cycles, 70 mAh g <sup>-1</sup> , 100 mA g <sup>-1</sup> , 500 cycles, 62 mAh g <sup>-1</sup>	24
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Sol-gel method	particles	20 mA g <sup>-1</sup> , 40 cycles, 114.7 mAh g <sup>-1</sup> , 20 mA g <sup>-1</sup> , 40 cycles, 82.3 mAh g <sup>-1</sup>	25
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid state reaction	particles	100 mA g <sup>-1</sup> , 50 cycles, 177.5 mAh g <sup>-1</sup>	26
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state (dry) and Solution-assisted (wet) sonochemical Solvothermal method	particles	0.05 C, 50 cycles,> 80 mAh g <sup>-1</sup> ,  0.05 C, 50 cycles, 60 mAh g <sup>-1</sup>	27
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solvothermal method	particles and spheres	50 mA g <sup>-1</sup> , 50 cycles, 103.9/ 104.3 mAh g <sup>-1</sup>	28

$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solvent method	thermal	Hollow microspheres	50 mA g <sup>-1</sup> , 50 cycles, 172.3 mAh g <sup>-1</sup> ,	29
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Sol-gel synthesis		particles	10 mA g <sup>-1</sup> , 50 cycles, 95 mAh g <sup>-1</sup>	30
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state reaction method		particles	100 mA g <sup>-1</sup> , 50 cycles, 211.8 mAh g <sup>-1</sup>	31
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid state method		particles	100 mA g <sup>-1</sup> , 50 cycles, 75.2 mAh g <sup>-1</sup>	32
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state method		particles	100 mA g <sup>-1</sup> , 50 cycles, 189.2 mAh g <sup>-1</sup>	33
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state method		particles	50 mA g <sup>-1</sup> , 50 cycles, 206.7 mAh g <sup>-1</sup>	34
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid state reaction method		particles	50 mA g <sup>-1</sup> , 50 cycles, 73.2 mAh g <sup>-1</sup>	35
$\text{Na}_2\text{Li}_2\text{Ti}_6\text{O}_{14}$	Solid-state method		particles	500 mA g <sup>-1</sup> , 100 cycles, 136.9 mAh g <sup>-1</sup>	36

1. X. T. Lin, P. F. Wang, P. Li, H. X. Yu, S. S. Qian, M. Shui, D. J. Wang, N. B. Long, J. Shu, *Electrochim. Acta*, **2015**, *186*, 24-33.
2. X. T. Lin, S. S. Qian, H. X. Yu, L. Yan, P. Li, Y. Y. Wu, N. B. Long, M. Shui, J. Shu, *Acs Sustain. Chem. Eng.*, **2016**, *4*, 4859-4867.
3. M. H. Luo, X. T. Lin, H. Lan, H. X. Yu, L. Yan, S. S. Qian, N. B. Long, M. Shui, J. Shu, *J. Electroanal. Chem.*, **2017**, *786*, 86-93.
4. X. X. Wu, X. Li, C. C. Zhu, P. Li, H. Yu, Z. Guo, J. Shu, *Mater. Today Energy*, **2016**, *1-2*, 17-23.

5. A. Chaupatnaik, P. Barpanda, *J. Mater. Res.*, **2019**, *34*, 158-168.
6. D. Dambournet, I. Belharouak, K. Amine, *Inorg. Chem.*, **2010**, *49*, 2822-2826.
7. D. Dambournet, I. Belharouak, J. Ma, K. Amine, *J. Power Sources*, **2011**, *196*, 2871-2874.
8. J. H. Liu, Y. A. Li, X. Q. Wang, Y. Gao, N. N. Wu, B. R. Wu, *J. Alloy Compd.*, **2013**, *581*, 236-240.
9. X. T. Lin, P. Li, P. F. Wang, H. X. Yu, S. S. Qian, M. Shui, X. Zheng, N. B. Long, J. Shu, *Electrochim. Acta*, **2015**, *180*, 831-844.
10. S. S. Qian, H. X. Yu, L. Yan, P. Li, H. Lan, H. J. Zhu, N. B. Long, M. Shui, J. Shu, *J. Power Sources*, **2017**, *343*, 329-337.
11. A. Dayamani, G. S. Shinde, A. Chaupatnaik, R. P. Rao, S. Adams, P. Barpanda, *J. Power Sources*, **2018**, *385*, 122-129.
12. Y. Y. Zhang, S. S. Qian, H. J. Zhu, X. Cheng, W. Q. Ye, H. X. Yu, L. Yan, M. Shui, J. Shu, *Ceram. Int.*, **2017**, *43*, 12357-12361.
13. Y. Y. Wu, S. S. Qian, H. Lan, L. Yan, H. X. Yu, X. Cheng, F. M. Ran, M. Shui, J. Shu, *Ceram. Int.*, **2017**, *43*, 7231-7236.
14. H. X. Yu, W. Q. Ye, X. Cheng, T. T. Liu, K. Goh, Z. B. Wang, J. Shu, *Ceram. Int.*, **2019**, *45*, 6885-6890.
15. P. Li, S. S. Qian, H. X. Yu, L. Yan, X. T. Lin, K. Yang, N. B. Long, M. Shui, J. Shu, *J. Power Sources*, **2016**, *330*, 45-54.
16. J. D. Zhang, H. X. Yu, N. B. Long, T. T. Liu, X. Cheng, R. T. Zheng, H. J. Zhu, W. Q. Ye, J. Shu, *Ceram. Int.*, **2018**, *44*, 9506-9513.
17. H. X. Yu, Y. F. Zhang, X. Cheng, H. J. Zhu, R. T. Zheng, T. T. Liu, J. D. Zhang, M. Shui, J. Shu, *Electrochim. Acta*, **2018**, *283*, 1460-1467.
18. C. Wang, X. Xin, M. Shu, S. P. Huang, Y. Zhang, X. Li, *Inorg. Chem. Front.*, **2019**, *6*, 866-867.
19. S. Y. Yin, L. Song, X. Y. Wang, Y. H. Huang, K. L. Zhang and Y. X. Zhang, *Electrochem. Commun.*, **2009**, *11*, 1251-1254.
20. K. Q. Wu, J. Shu, X. T. Lin, L. Y. Shao, P. Li, M. Shui, M. M. Lao, N. B. Long and D. J. Wang, *J. Power Sources*, **2015**, *275*, 419-428.
21. P. Li, K. Q. Wu, P. F. Wang, X. T. Lin, H. X. Yu, M. Shui, X. Zhang, N. B. Long and J. Shu, *Ceram. Int.*, **2015**, *41*, 14508-14516.
22. S. S. Qian, H. X. Yu, L. Yan, P. Li, X. T. Lin, Y. Bai, S. J. Wang, N. B. Long, M. Shui and J. Shu, *Ceram. Int.*, **2016**, *42*, 6874-6882.
23. J. Shu, K. Q. Wu, P. F. Wang, P. Li, X. T. Lin, L. Y. Shao, M. Shui, N. B. Long and D. J. Wang, *Electrochim. Acta*, **2015**, *173*, 595-606.
24. S. Y. Yin, C. Q. Feng, S. J. Wu, H. L. Liu, B. Q. Ke, K. L. Zhang and D. H. Chen, *J. Alloys Compd.*, **2015**, *642*, 1-6.
25. K. Q. Wu, D. J. Wang, X. T. Lin, L. Y. Shao, M. Shui, X. X. Jiang, N. B. Long, Y. L. Ren, J. Shu, *J. Electroanal. Chem.*, **2014**, *717-718*, 10-16.
26. P. F. Wang, P. Li, T. F. Yi, X. T. Lin, H. X. Yu, Y. R. Zhu, S. S. Qian, M. Shui and J. Shu, *J. Power Sources*, **2015**, *297*, 283-294.
27. S. Ghosh, Y. Kee, S. Okada and P. Barpanda, *J. Power Sources*, **2015**, *296*, 276-281.
28. S. S. Fan, H. T. Yu, Y. Xie, T. F. Yi and G. H. Tian, *Electrochim. Acta*, **2018**, *259*, 855-864.
29. S. S. Fan, H. Zhong, H. T. Yu, M. Lou, Y. Xie and Y. R. Zhu, *Sci. China Mater.*, **2017**, *60*, 427-437.
30. D. Dambournet, L. Belharouak and K. Amine, *Inorg. Chem.*, **2010**, *49*, 2822-2826.
31. M. M. Lao, X. T. Lin, P. Li, L. Y. Shao, K. Q. Wu, M. Shui, N. B. Long, Y. L. Ren and J. Shu, *Ceram. Int.*, **2015**, *41*, 2900-2907.

32. K. Q. Wu, J. Shu, X. T. Lin, L. Y. Shao, M. M. Lao, M. Shui, P. Li, N. B. Long and D. J. Wang, *J. Power Sources*, 2014, **272**, 283-290.
33. P. F. Wang, S. S. Qian, T. F. Yi, H. X. Yu, L. Yan, P. Li, X. T. Lin, M. Shui and J. Shu, *ACS Appl. Mater. Interfaces*, 2016, **8**, 10302–10314.
34. H. Lan, S. S. Qian, Q. Wang, L. Yan, H. X. Yu, P. Li, N. B. Long, M. Shu and J. Shu, *Ceram. Int.*, 2017, **43**, 1552-1557.
35. C. Sun, X. Li, X. Z. Wu, C. C. Zhu, H. X. Yu, Z. Y. Guo and J. Shu, *J. Electroanal. Chem.*, 2017, **802**, 100-108.
36. X. Han, X. Gui, W. Tao, X. F. Li and T. F. Yi, *Ceram. Int.*, 2018, **44**, 12273-12281.