Electronic Supplementary Information

Insights into the crystallization-like activation mechanism of diatom biosilica as an anode for next-generation Li-ion batteries

Yuxin Chen, [a] Hongchang Liu, *[ab] Kang Yang, [a] Zhanyuan Nie, [ab] Jinlan Xia, [ab] Ze Shen, [a] Jianping Xie, [ab] and Hongwei Liu [ab]

[a] School of Minerals Processing and Bioengineering, Central South University, Changsha 410083, China.

[b] Key Lab of Biometallurgy of Ministry of Education of China, Central South University, Changsha 410083, China.

E-mail: hchliu2050@csu.edu.cn

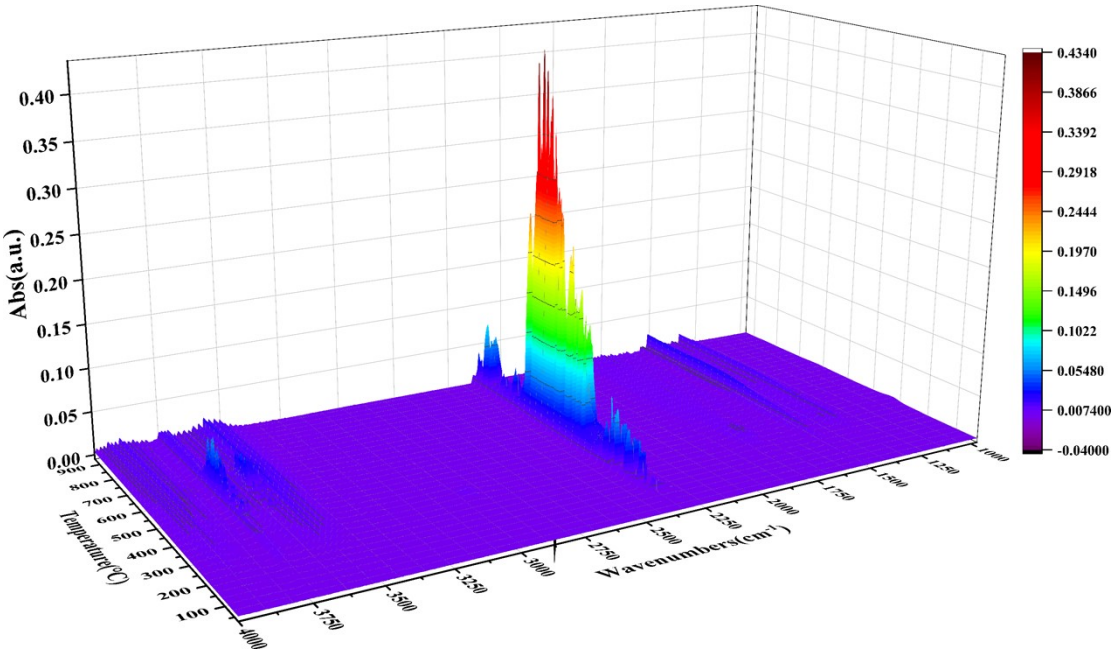

Fig. S1. *In-situ* 3D infrared image of diatom during the calcination.

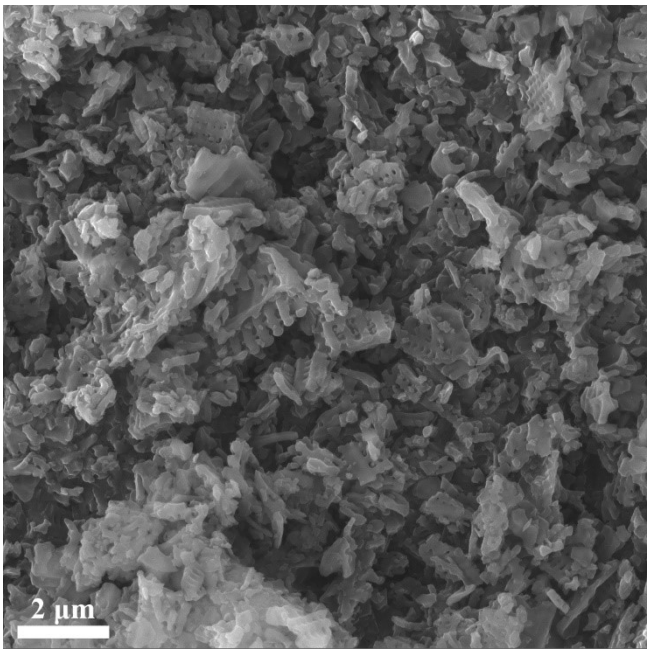

Fig. S2. SEM image of DBS.

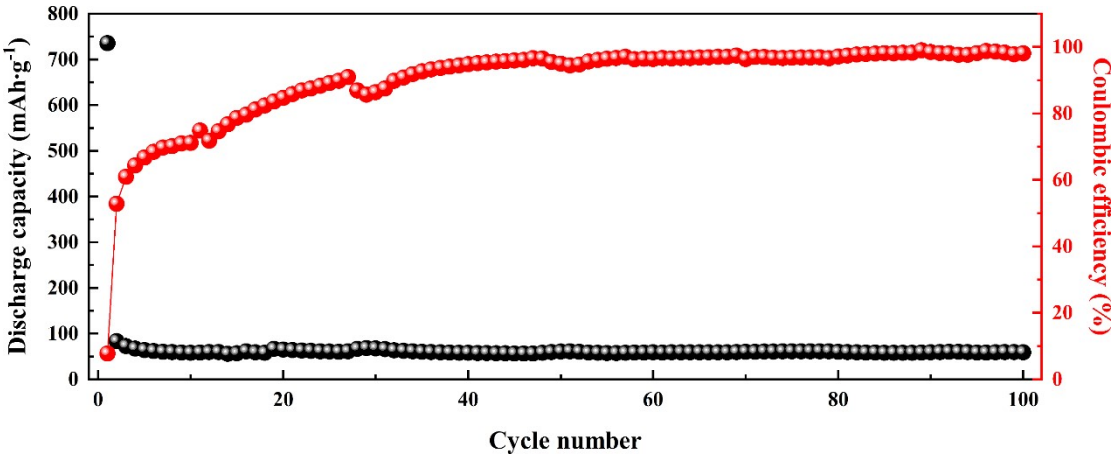

Fig. S3. Long-term cycle performance of DBS anode.

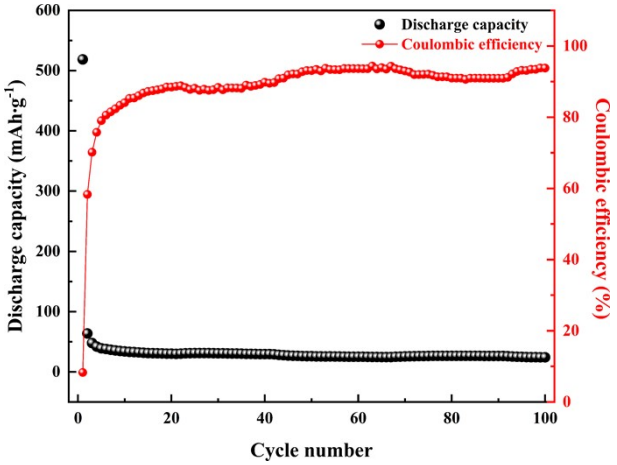

Fig. S4. Long-term cycle performance of SiO_2 anode.

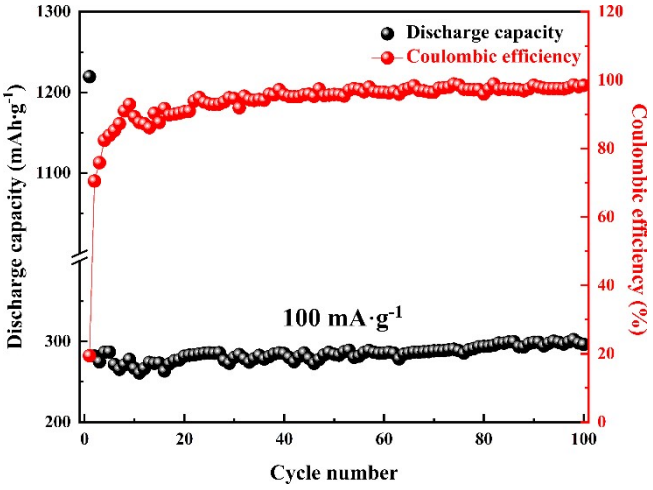

Fig. S5. Long-term cycle performance of DBS@C anode.

Table S1. Comparison of electrochemical properties of diatom-based anodes.

Anode	Long-term cycle performance	Reference
This work	~900 mAh·g^{-1} at 1 A·g^{-1} after 400 cycles	——
DB@C	240 mAh·g^{-1} at 500 mA·g^{-1} after 50 cycles	[1]
SiO_2/C	614 mAh·g^{-1} at 100 mA·g^{-1} after 100 cycles	[2]
DB/CB	409 mAh·g^{-1} at 20 mA·g^{-1} after 100 cycles	[3]
SiO_2/C	600 mAh·g^{-1} at 200 mA·g^{-1} after 50 cycles	[4]
DBS@C-Co	620 mAh·g^{-1} at 100 mA·g^{-1} after 270 cycles	[5]

Reference

1 P. Nowak, M. Sprynskyy, I. Wojtczak, K. Trzciński, J. Wysocka, M. Szkoda, B. Buszewski and A. Lisowska-Oleksiak, Diatoms Biomass as a Joint Source of Biosilica and Carbon for Lithium-Ion Battery Anodes, *Materials*, 2020, **13**, 1673.

2 V. Renman, M. V. Blanco, A. N. Norberg, F. Vullum-Bruer and A. M. Svensson, Electrochemical activation of a diatom-derived SiO2/C composite anode and its implementation in a lithium ion battery, *Solid State Ionics*, 2021, **371**, 115766.

3 P. Nowaka, M. Sprynskyy, W. Brzozowska and A. Lisowska-Oleksiak, Electrochemical behavior of a composite material containing 3D-structured diatom biosilica, *Algal Research*, 2017, **41**, 101538.

4 N. Norberg, N. P. Wagner, H. Kaland, F. Vullum-Bruerc and A. M. Svensson, Silica from diatom frustules as anode material for Li-ion batteries, *RSC Advances*, 2019, **9**, 41228.

5 Y. X. Chen, H. C. Liu, W. Q. Xie, Z. Shen, J. L. Xia, Z. Y. Nie and J. P. Xie, Diatom Frustules Decorated with Co Nanoparticles for the Advanced Anode of Li-Ion Batteries, *Small*, 2023, **19**, 2300707.