

## **Dual-dimensional regulation of interface and stress via a composite anode for stable gel-based solid-state lithium metal batteries**

Yuhao Zhu<sup>a</sup>, Wenhui Bai<sup>a</sup>, Jingjing Ma<sup>a</sup>, Bo Lu<sup>a</sup>, Sheng Chen<sup>a</sup>, Xiaogang Mu<sup>a</sup>, Bo Liu<sup>a</sup>, Weiwei Sun<sup>b</sup>, Yu Han<sup>b</sup>, Shizhao Xiong<sup>c</sup>, Yangyang Liu<sup>d</sup>, Jiajia Li<sup>e</sup>, Huimin Zhao<sup>e</sup>, Xingxing Jiao<sup>f,\*</sup>, Qingpeng Guo<sup>b,\*</sup>, Xuanjun Wang<sup>a,\*</sup>

<sup>a</sup> Zhijian Laboratory, Rocket Force University of Engineering, Xi'an 710025, China

<sup>b</sup> College of Aerospace Science and Engineering, National University of Defense Technology, Changsha, Hunan 410073, China

<sup>c</sup> Faculty of Materials Science and Engineering, Kunming University of Science and Technology, Kunming 650093, Yunnan, China

<sup>d</sup> School of Instrument Science and Technology, Xi'an Jiaotong University, Xi'an 710049, China

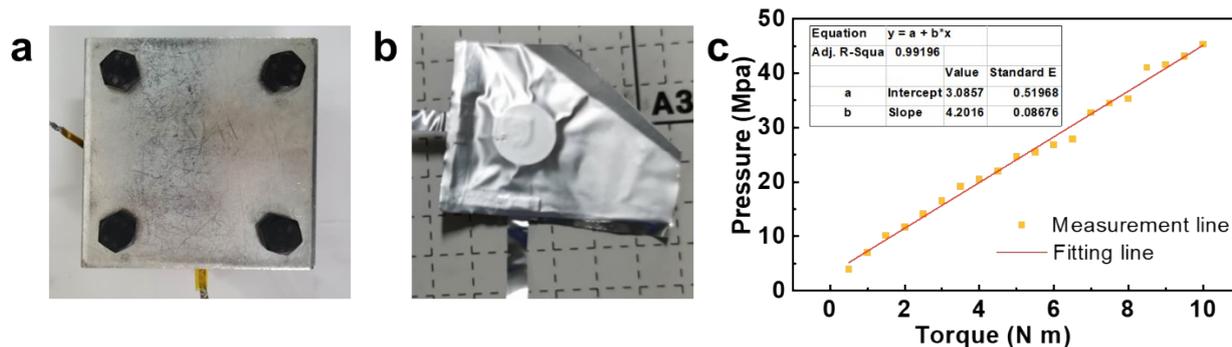
<sup>e</sup> Beijing Key Laboratory of Solid State Battery and Energy Storage Process, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, China

<sup>f</sup> Research Institute of Frontier Science, Southwest Jiaotong University, Chengdu 610031, China

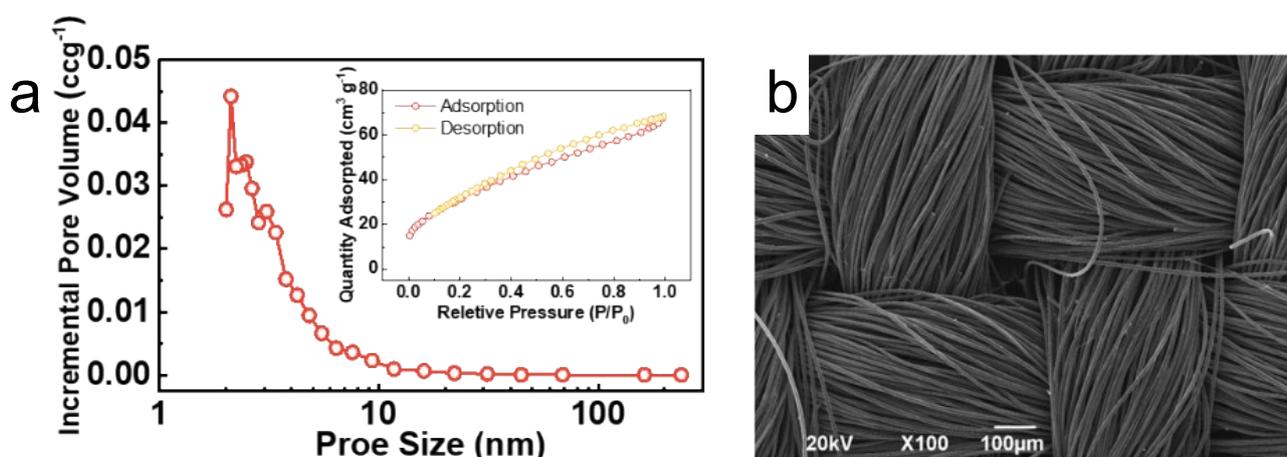
\* Corresponding authors.

E-mail addresses: [xxjiao@swjtu.edu.cn](mailto:xxjiao@swjtu.edu.cn) (X. Jiao); [qingpeng.guo@nudt.edu.cn](mailto:qingpeng.guo@nudt.edu.cn) (Q. Guo); [wangxj503@sina.com](mailto:wangxj503@sina.com) (X Wang)

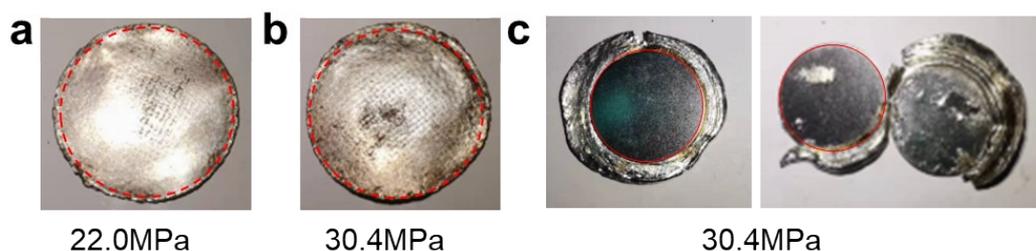
**Keywords:** Solid-state electrolyte, Li metal, carbon fiber cloth/lithium metal composite, compressive resistance, interface



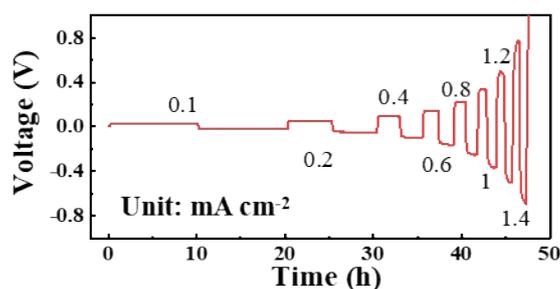
**Figure S1.** (a-b) Optical photo of pressure mode and assembled battery for pressure test. (c) The relationship curve of torque force and pressure.



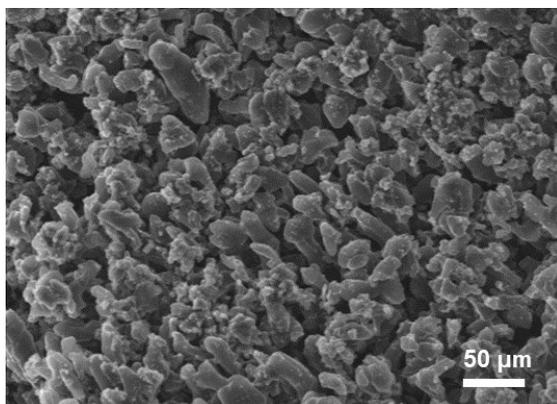
**Figure S2.** Properties of carbon fiber cloth. (a) BET testing of carbon fiber cloth; (b) The SEM image of surface microstructure of carbon fiber cloth.



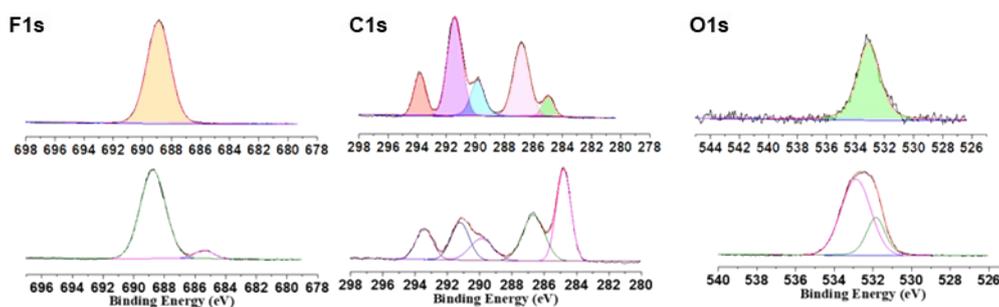
**Figure S3.** (a-c) Deformation of the G-LiCFC composite and Li sheet anode electrode with pressures of 22.0 MPa and 30.4 MPa.



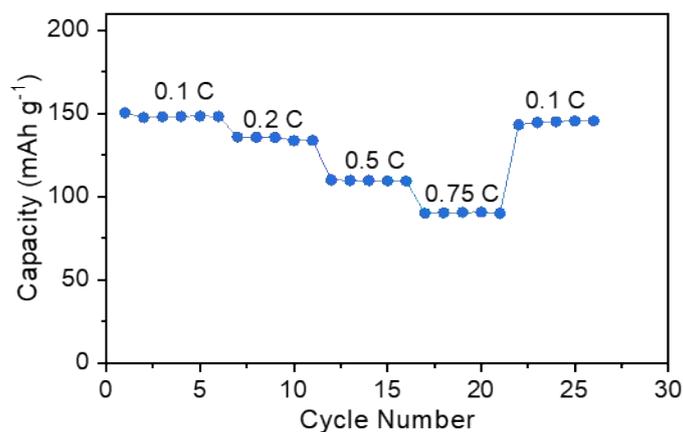
**Figure S4.** The critical current density of LiCFC|GPE|LiCFC at the current density of 0.1 to 1.6 mA cm<sup>-2</sup> under an areal capacity of 1 mAh cm<sup>-2</sup>.



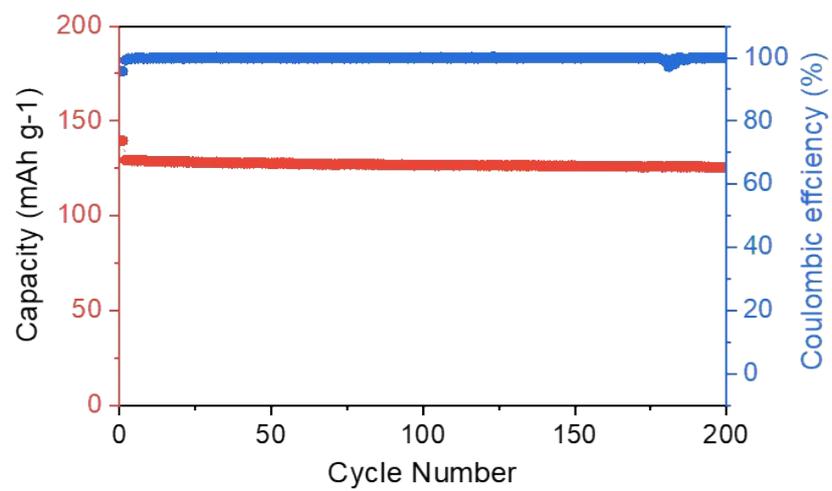
**Figure S5.** SEM images of Li metal anode under low capacity of 0.25 mAh cm<sup>-2</sup>.



**Figure S6.** XPS spectra of LiCFC and bare lithium anodes after cycling.



**Figure S7.** Rate performance of the LiFePO<sub>4</sub>|GPE|G-LiCFC full cell.



**Figure S8.** Cycling performance of LiFePO<sub>4</sub>|GPE|G-LiCFC full cell under a pressure of 2 MPa.