

Supporting Information

In-Situ Fabricated Photo-Electro-Catalytic Hybrid Cathode for Light-Assisted Lithium-CO₂ batteries

Zhe Li,^{‡a} Ma-Lin Li,^{‡bc} Xiao-Xue Wang,^b De-Hui Guan,^b Wan-Qiang Liu^{*a} and Ji-Jing Xu^{*bc}

^a School of Materials Science and Engineering, Changchun University of Science and Technology, Changchun 130022, China.

^b State Key Laboratory of Inorganic Synthesis and Preparative Chemistry, College of Chemistry, Jilin University, Changchun 130012, P.R. China.

^c International Center of Future Science, Jilin University, Changchun 130012, P. R. China.

[‡] These authors contributed equally to this work

* Correspondence author: wqliu1979@126.com; jijingxu@jlu.edu.cn

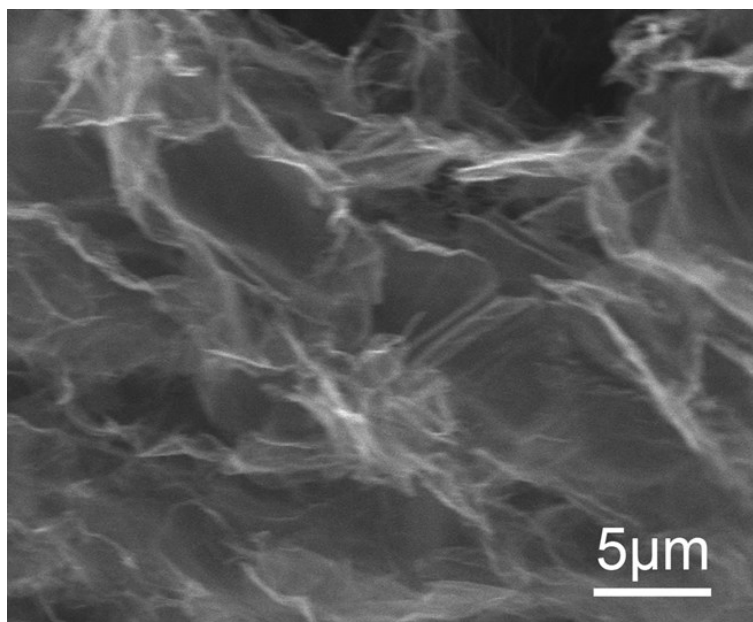


Figure S1 SEM image of RGO. The RGO presents two-dimensional nanosheets morphology with micron long wrinkles.

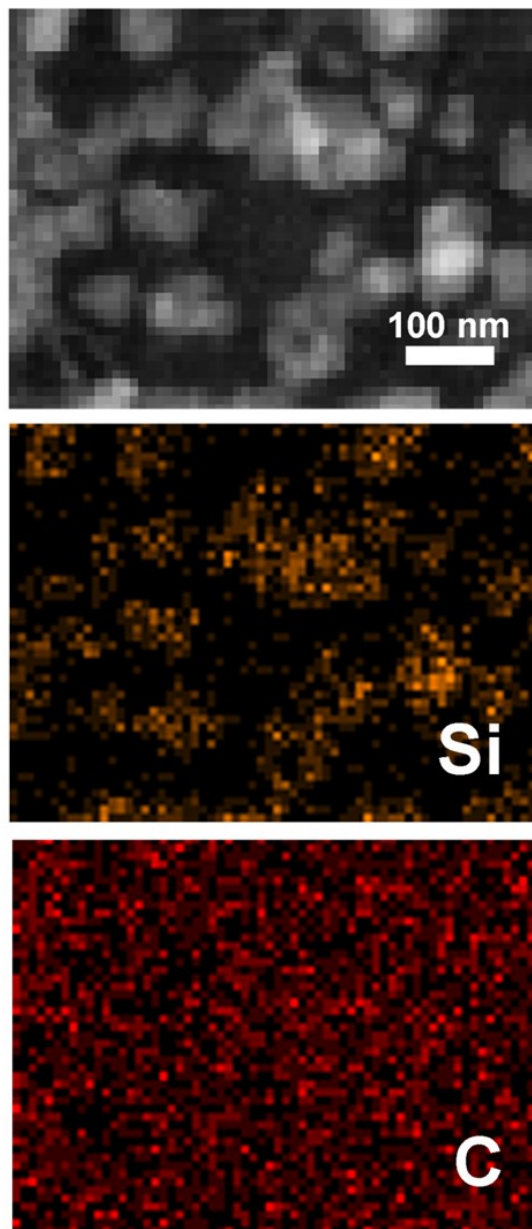


Figure S2 Element mappings of SiC/RGO nanocomposite.

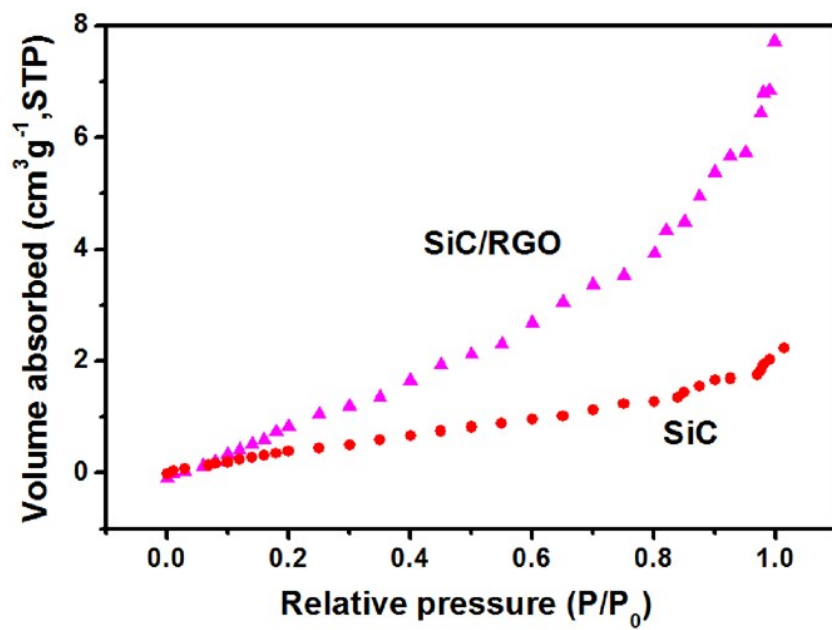


Figure S3 CO₂ adsorption isotherms of SiC/RGO and pure SiC samples.

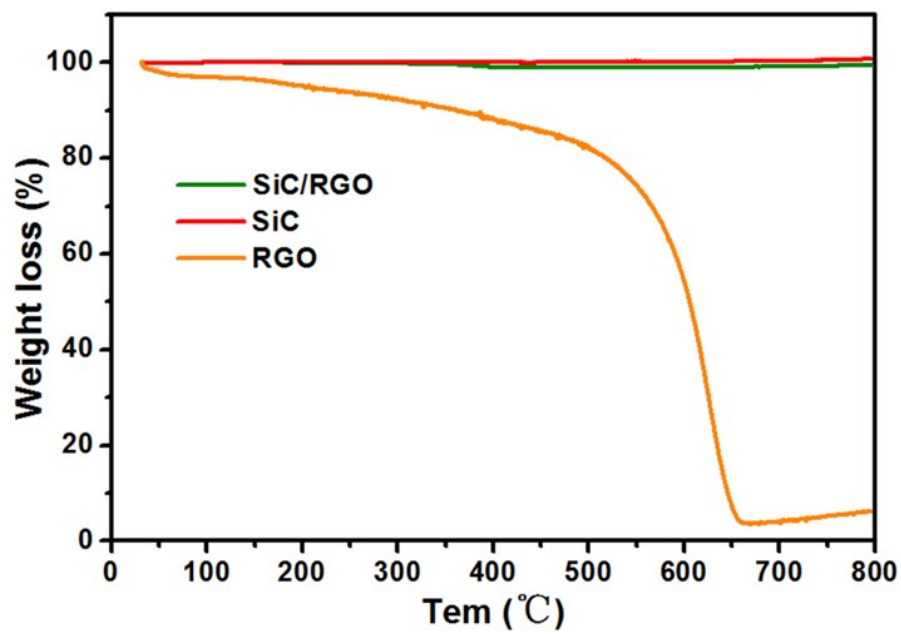


Figure S4 TG curves of SiC, SiC/RGO and RGO samples.

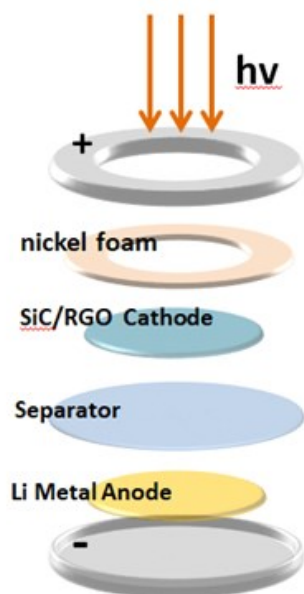


Figure S5 Schematic configuration diagram of light-assisted Li-CO₂ battery.

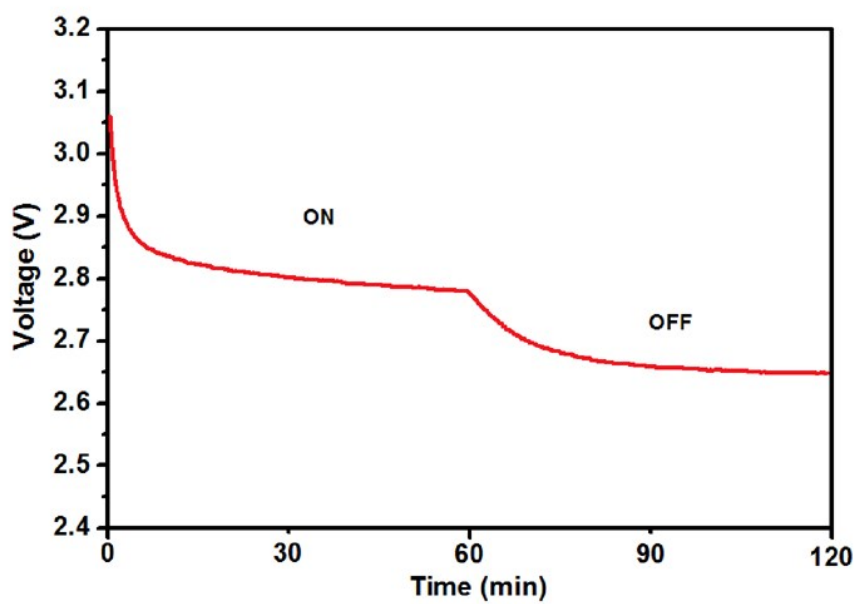


Figure S6 Photo response of the discharge voltage in a photo-assisted Li-CO₂ battery with a current density of 20 mA g⁻¹ when illumination is switched from "on" to "off".

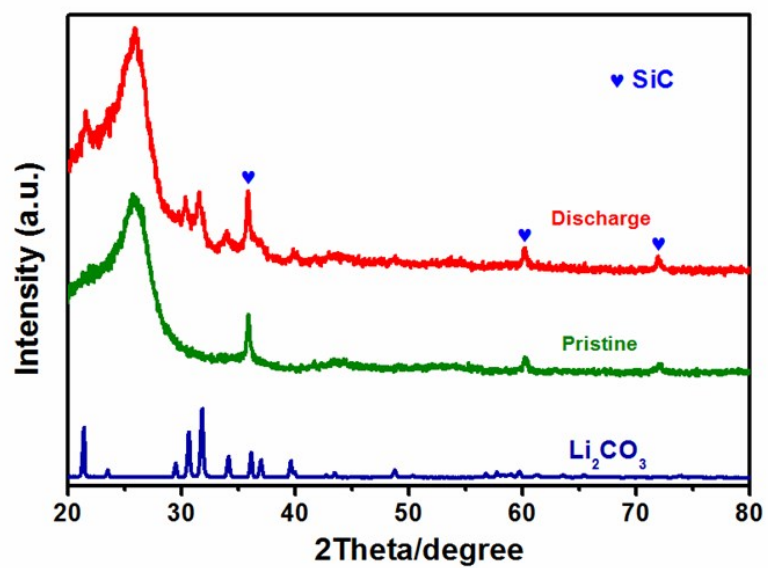


Figure S7 XRD patterns of the cathodes after being discharged to the capacity of 1000 mA h g⁻¹ with a current density of 20 mA g⁻¹.

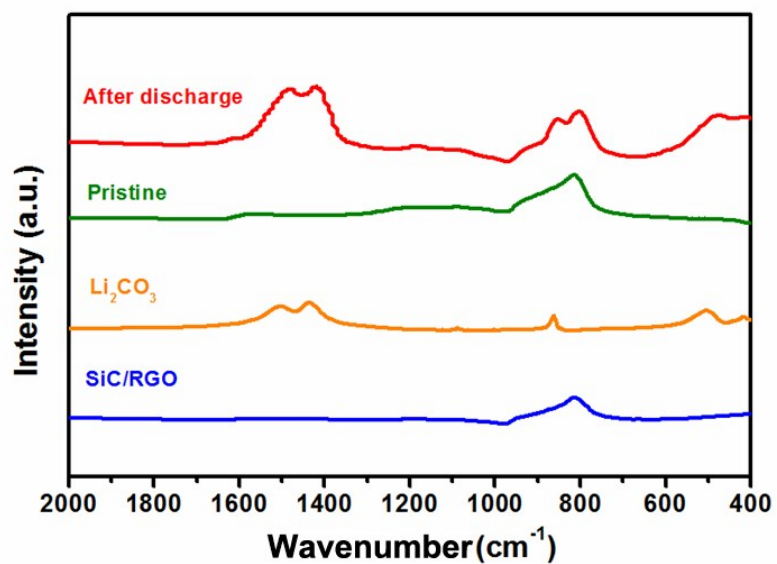


Figure S8 FTIR spectra of the cathodes after being discharged to the capacity of 1000 mA h g⁻¹ with a current density of 20 mA g⁻¹.

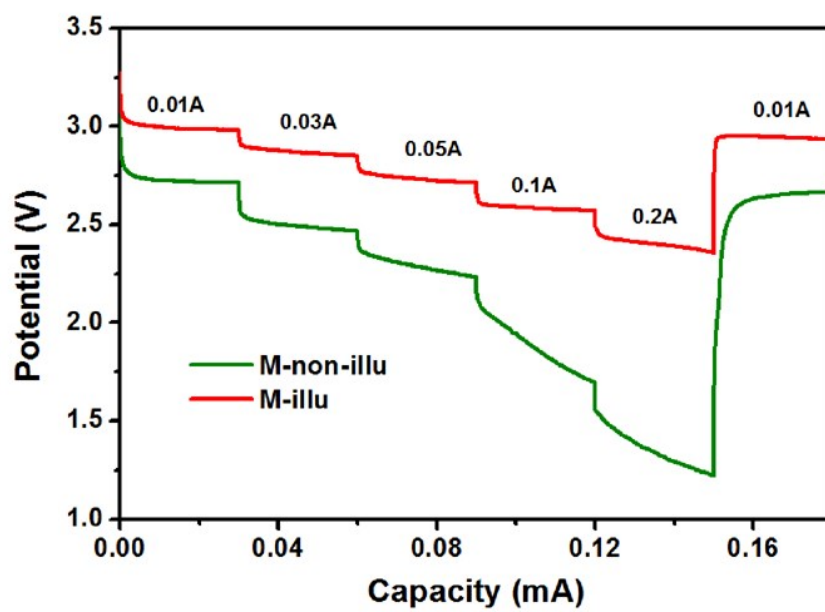


Figure S9 Rate performance of the Li-CO₂ batteries using SiC/RGO cathodes with and without illumination.

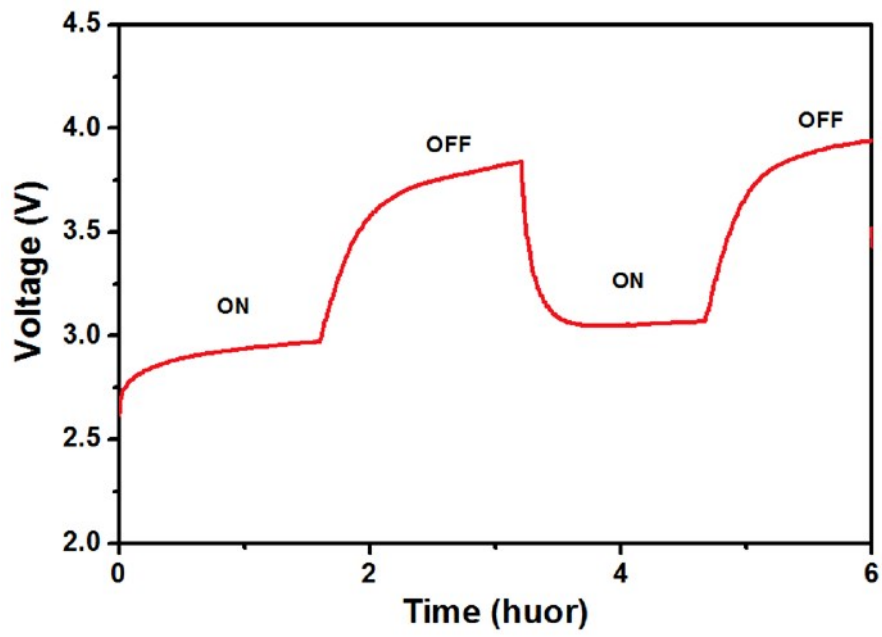


Figure S10 Photo response of the charge voltage in a photo-assisted Li-CO₂ battery at a current density 20 mA g⁻¹ with the illumination switching between "on" and "off".

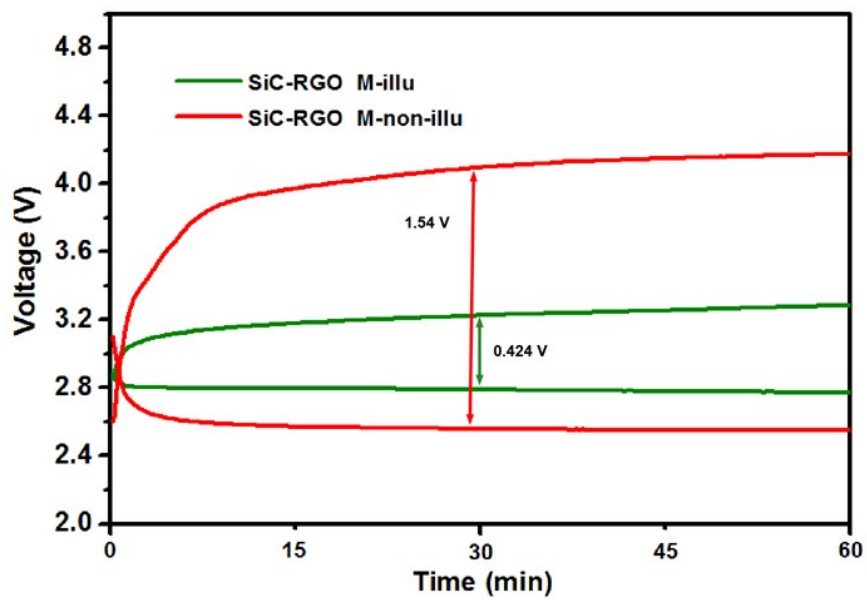


Figure S11 The first charge and discharge curve at a current density of 20 mA g^{-1} with and without illumination.

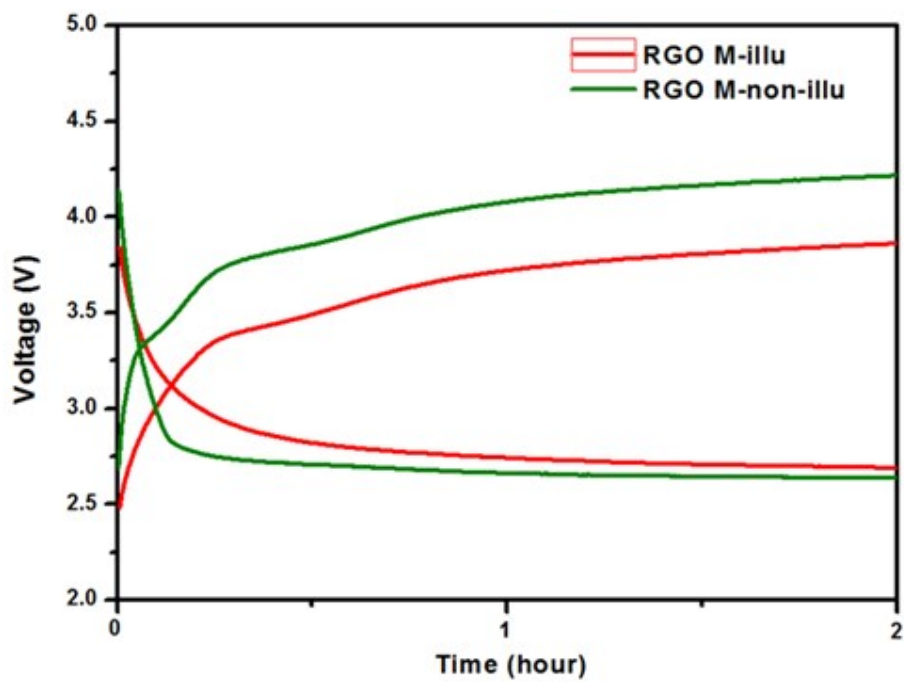


Figure S12 Charge and discharge profiles of Li-CO₂ battery using RGO cathode with and without lighting.

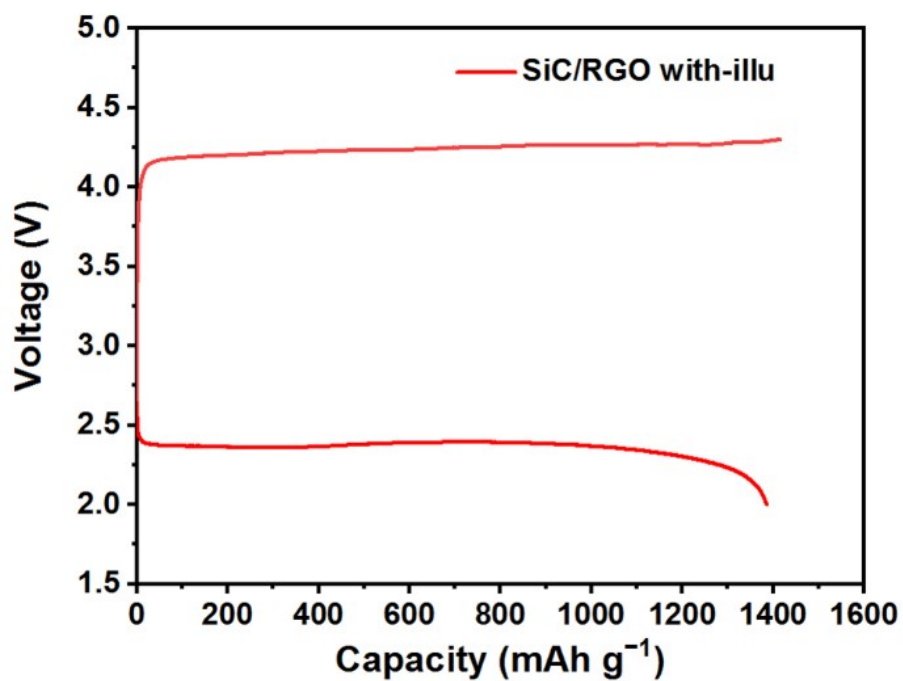


Figure S13 Charge and discharge profiles of the Li-CO₂ battery at a current density of 50 mA g⁻¹ in the voltage range from 2.0 to 4.3 V with lighting.

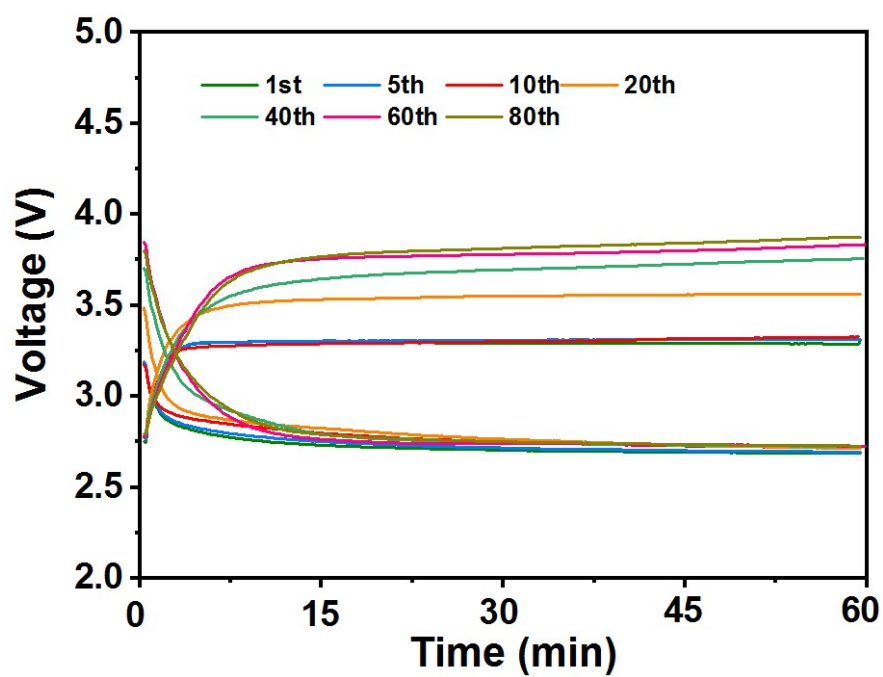


Figure S14 Galvanostatic profiles of the photo-assisted Li-CO₂ battery using SiC/RGO cathode at a current density of 20 mA g⁻¹ with lighting.

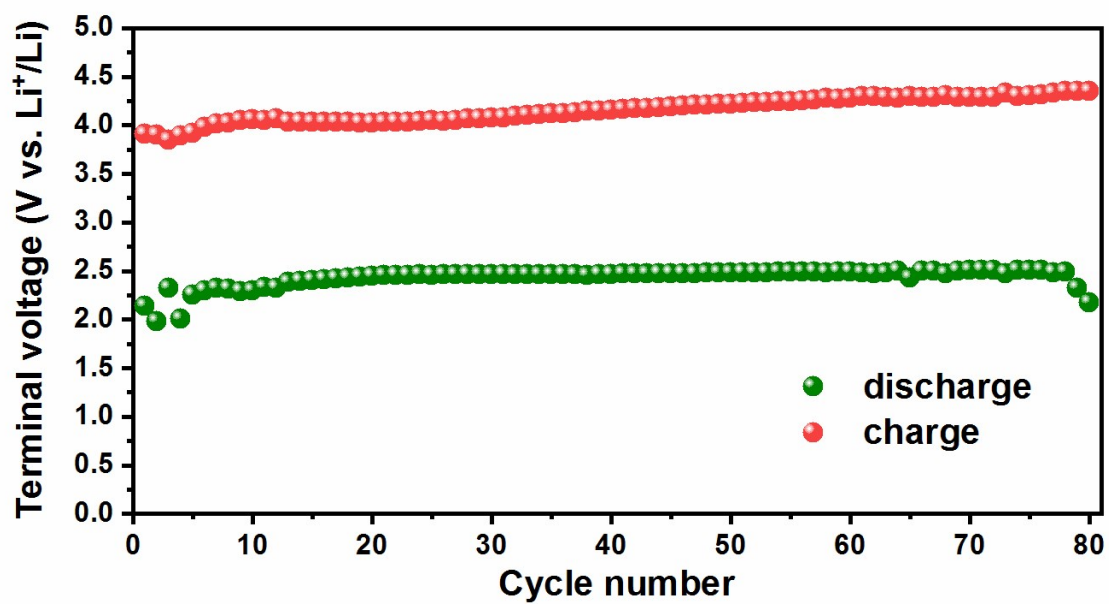


Figure S15 Cyclic performance of the photo-assisted Li-CO₂ battery with SiC/RGO cathode at a current density of 100 mA g⁻¹.

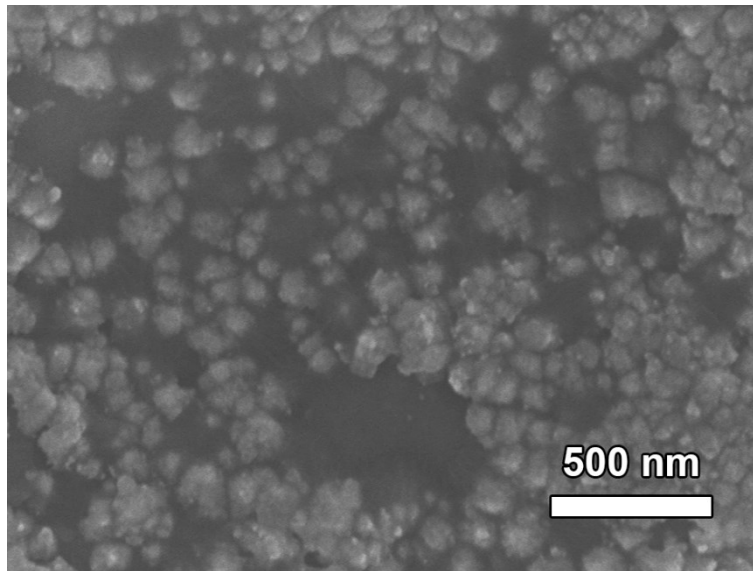


Figure S16 SEM image of the SiC/RGO cathode after 20 cycles under illumination.

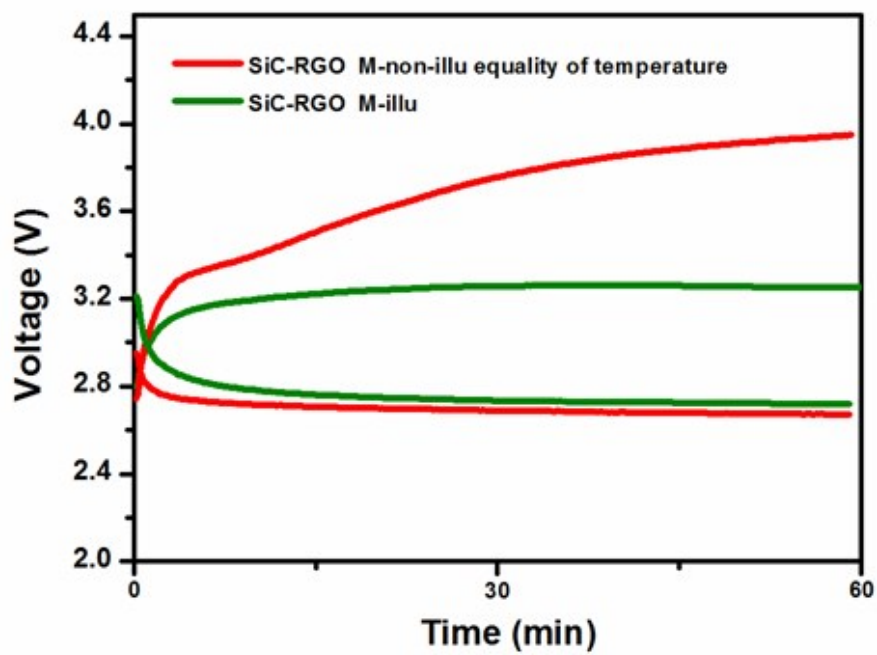


Figure S17 Charge and discharge profiles of Li-CO₂ battery using SiC/RGO cathode with lighting and at the same temperature as the lighting.

Table S1 The overpotential of Li-CO₂ batteries with different cathodes.

Cathodes	Overpotential (V)	Energy efficiency (%)	Refs
CNTs	1.65	-	38
Ru-Cu-G cathodes	0.88	-	37
CoPPc	1.08	74	20
CQD/hG-0.3	1.02	-	17
Ru@Super P	-	71	18
CC@Mo ₂ C NPs	0.65	80	19
Ir NSs-CNFs	0.85	-	10
Mn ₂ (dobdc)	1.30	67	23
SiC/RGO	0.42	84	This work