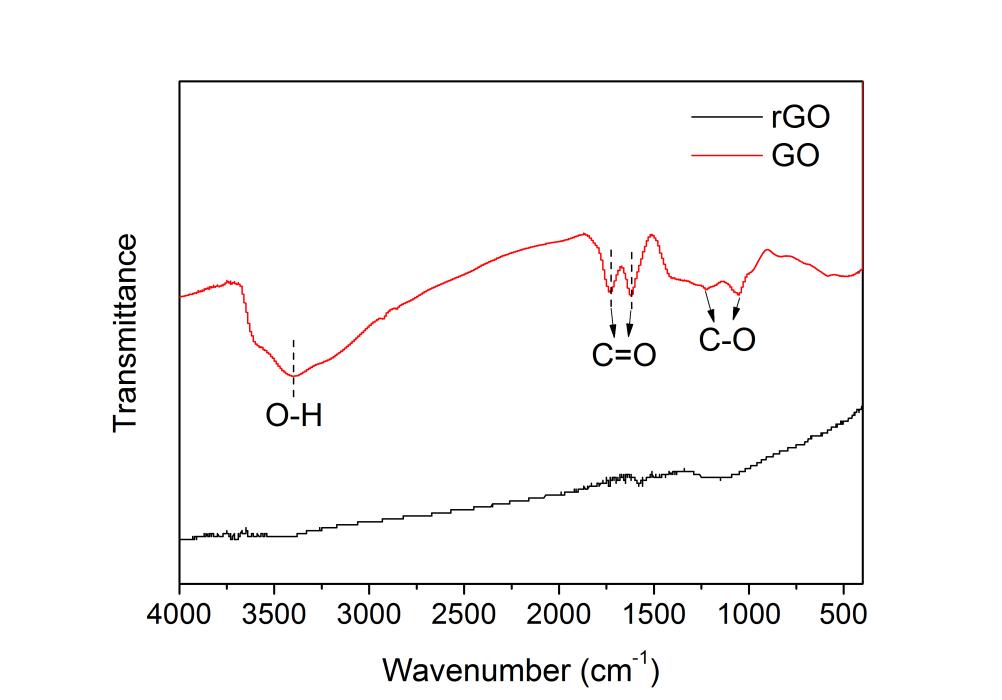
**Supplementary information**

**Sandwich-like structure C/SiO*x*@graphene anode material with high electrochemical performance for lithium ion batteries**

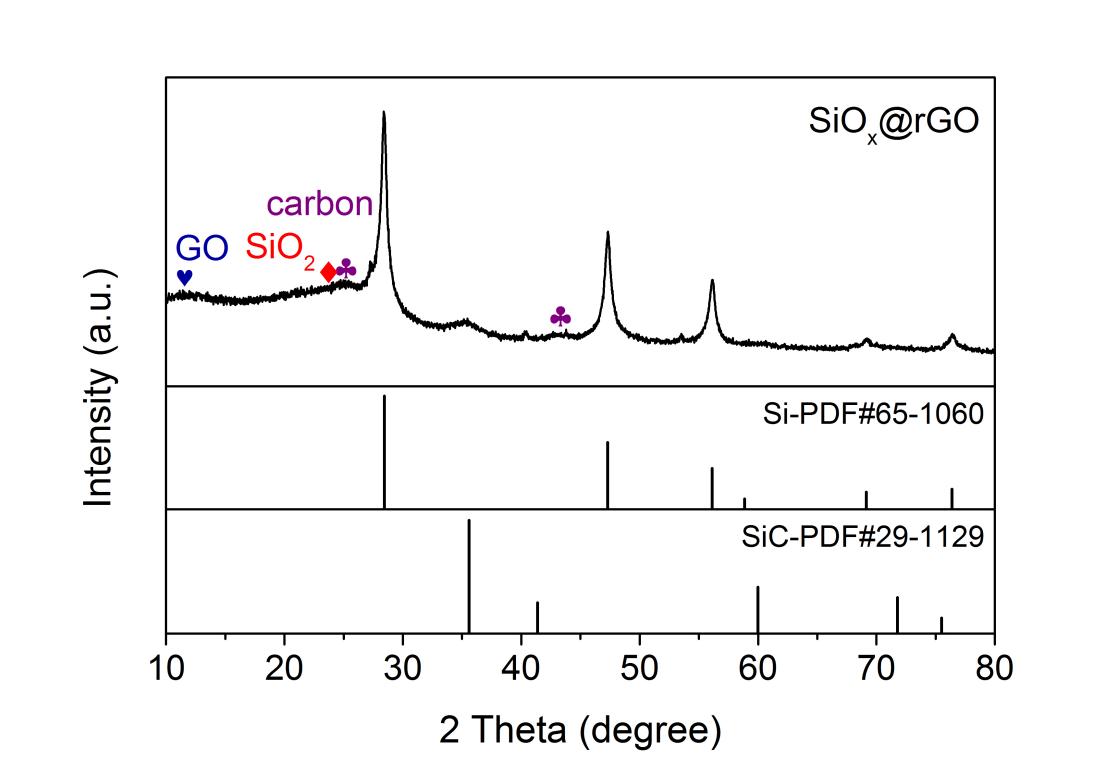
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**Fig. S1.** FTIR spectra of rGO and GO.

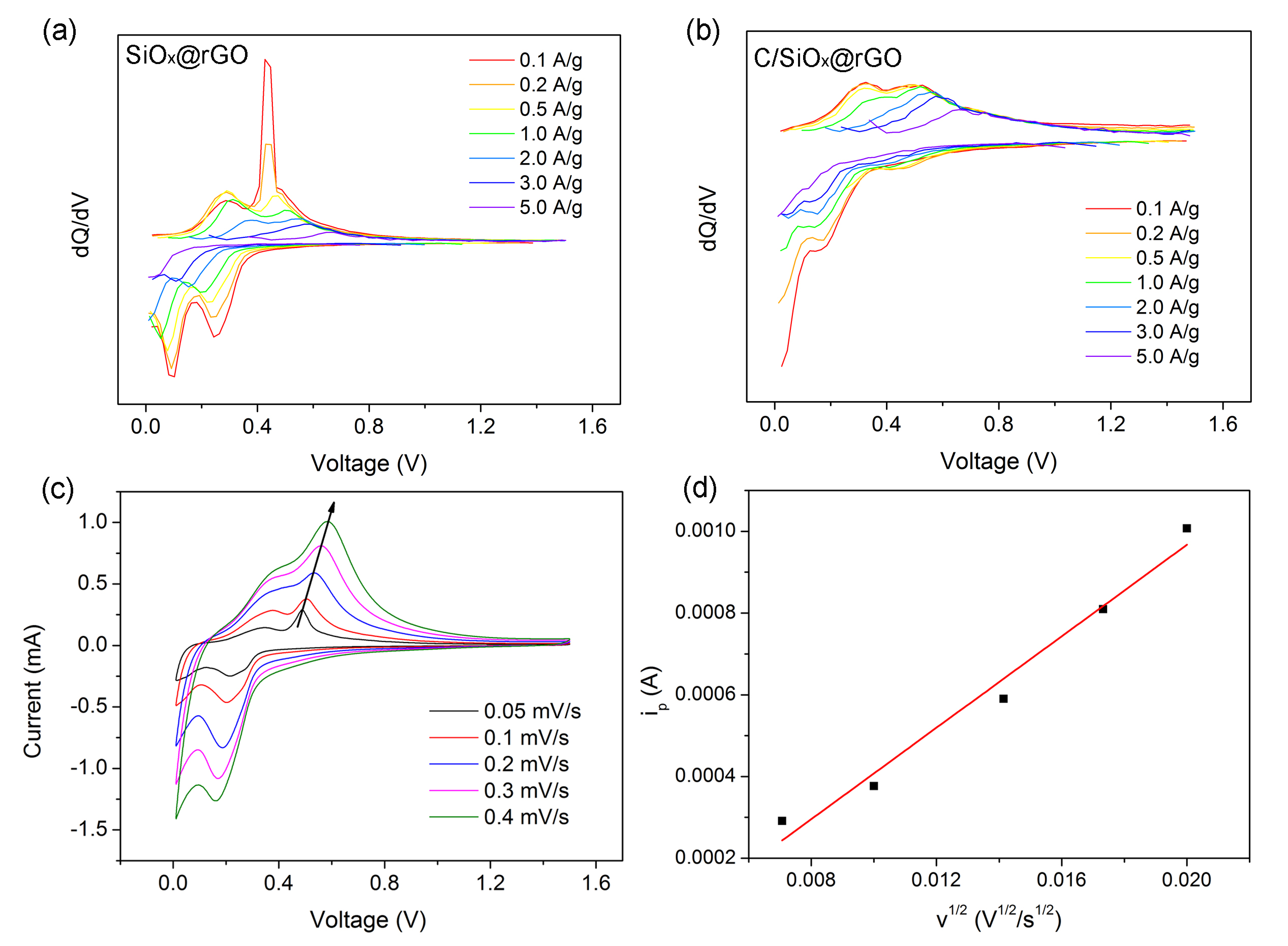


**Fig. S2.** XRD pattern of SiO*x*@rGO material.

The lithium diffusion coefficient (*D*Li+) of C/SiO*x*@rGO electrode can be calculated based on the CV data at different scan rates (Fig. S3(c)) and the following equation (Eq. (S1)):

*i*p = 2.69×105·*A*·*n*3/2·*C*0·*D*1/2·*ν*1/2 (S1)

where *i*p is the peak current (A), *n* is the charge concentration in Li*x*Si (as anodic peak Ⅱ is chosen in calculation, *n* = 2), *A* is the contact area between SiO*x* and electrolyte (here the geometric area of electrode, 1.13 cm2, is used for simplicity), *C*0 is the bulk concentration of lithium in electrode (0.0549 mol/cm3, calculated from Li2Si), and *ν* is the scan rate. A linear relationship between *i*p and *ν*1/2 is obtained, and the diffusion coefficient of lithium ions in C/SiO*x*@rGO is calculated according to the slope (Fig. S3(d)). The *D*Li+ of C/SiO*x*@rGO electrode is calculated to be 1.4 × 10−12 cm2/s.



**Fig. S3.** Differentiate curves at different current densities of SiO*x*@rGO (a) and C/SiO*x*@rGO (b) electrodes. Cyclic voltammetry curves with different scan rates: 0.05, 0.1, 0.2, 0.3, and 0.4 mV/s (c); The relationship of the peak current (*i*p) and the square root of scan rate (*ν*1/2) (d).

**Table S1**. Comparison of electrochemical performance of recently reported SiO*x*/graphene anode materials

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sample | Voltage range / V | ICE / % | Specific capacity / (mAh·g−1) | Current density / (A·g−1) | Cycles | Retention / % | Ref. |
| C/SiO*x*@rGO | 0.01–1.5 | 47.0 | 886 | 0.1 | 100 | 73.7 | This work |
| — | 396 | 5.0 | — | 44.7 |
| SiO*x*/rGO composite | 0.01–1.5 | 13.8 | 103 | 0.1 | 120 | 60 | [1] |
| SiO*x*/graphene | 0.01–3.0 | 51.7 | 1207 | 0.2 | 200 | 82.3 | [2] |
| — | 418 | 2.0 | — | 34.6 |
| Gr-coated SiO*x* | 0.01–1.5 | 71.2 | 1317 | 0.2 | 100 | 59.2 | [3] |
| Meso-porous SiO*x*/rGO composite | 0.01–1.5 | 68.1 | 2563 | 0.2 | 200 | 22.6 | [4] |
| Si@SiO*x*/graphene | 0.01–2.0 | 53.0 | 3000 | 0.1 | — | — | [5] |
| — | 1020 | 4.0 | — | 34.0 |
| Si@SiO*x*@C | 0.01–3.0 | 50.7 | 537 | 0.1 | 200 | >100 (capacity climb) | [6] |
| — | 56 | 5.0 | — | 10.4 |

**References**

1. *Mater. Lett.*, 299(2021), p. 130043.
2. *Electrochim. Acta*, 422(2022), p. 140572.
3. *Chem. Eng. J.*, 442 (2022), p. 136166.
4. *Electrochim. Acta*, 273(2018), p. 26.
5. *J. Power Sources*, 306(2016), p. 42.
6. *Electrochim. Acta*, 402(2022), p. 139556.