

## Electronic Supporting Information

### **Synergistic Bi<sub>2</sub>S<sub>3</sub>/MXene composite with enhanced performance for anode material of sodium-ion battery**

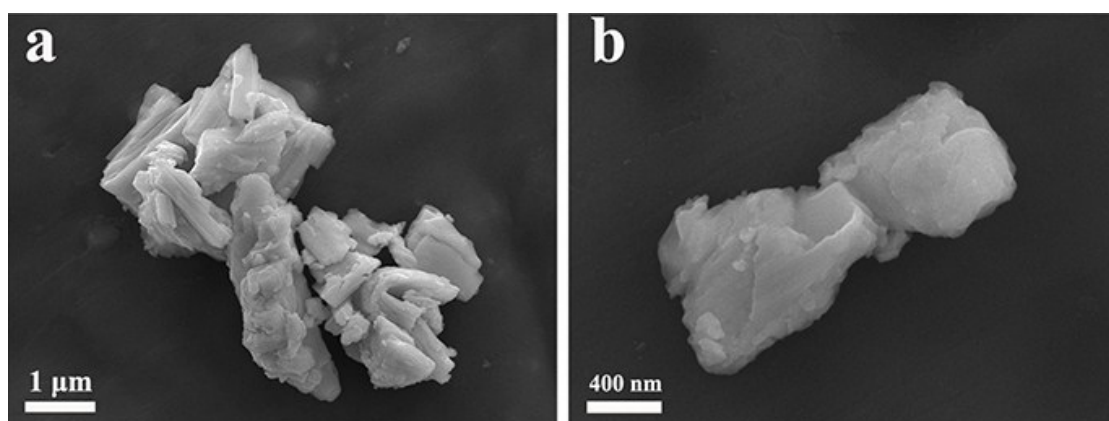
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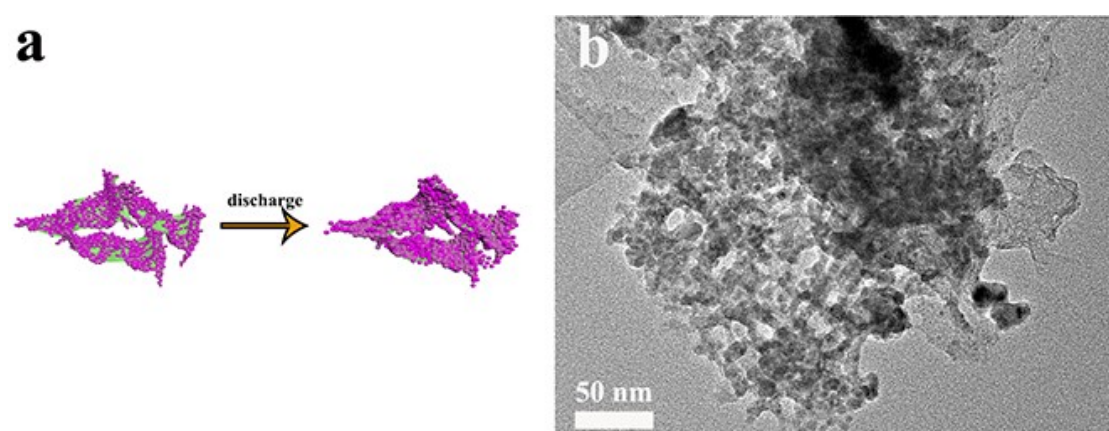
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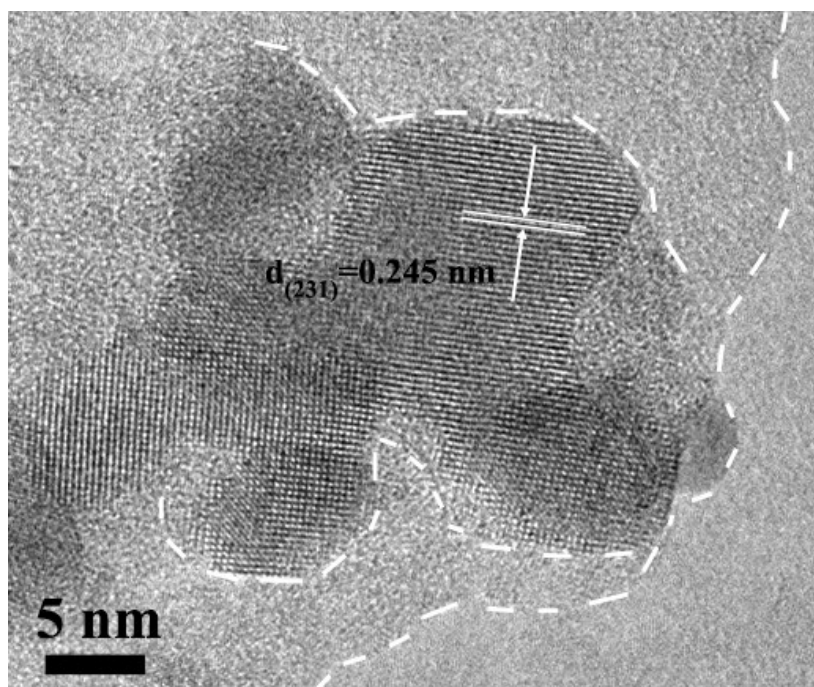
Tel: +86-023-68254372



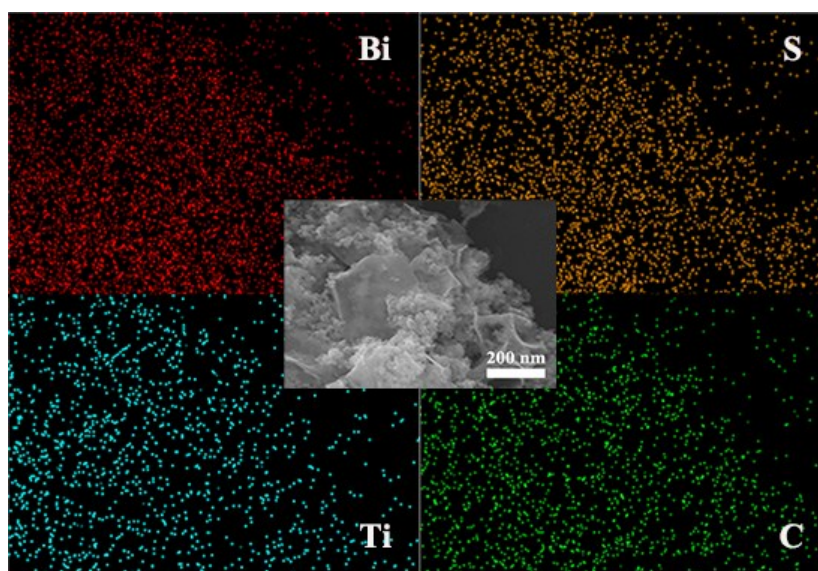
**Fig. S1** FESEM image of pure  $\text{Bi}_2\text{S}_3$  at different magnification.



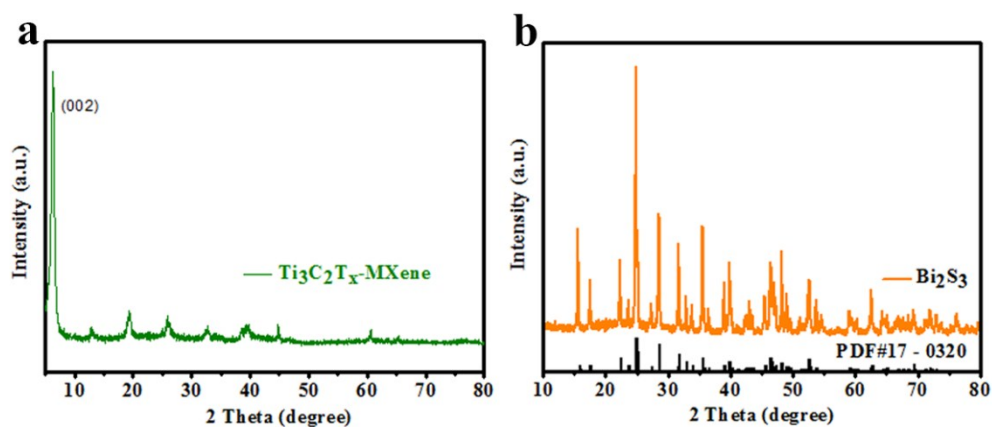
**Fig. S2** (a) Schematic illustration of  $\text{Bi}_2\text{S}_3/\text{MXene}$  composite in charge and discharge; (b) TEM images of  $\text{Bi}_2\text{S}_3/\text{MXene}$  composite after the cycle.



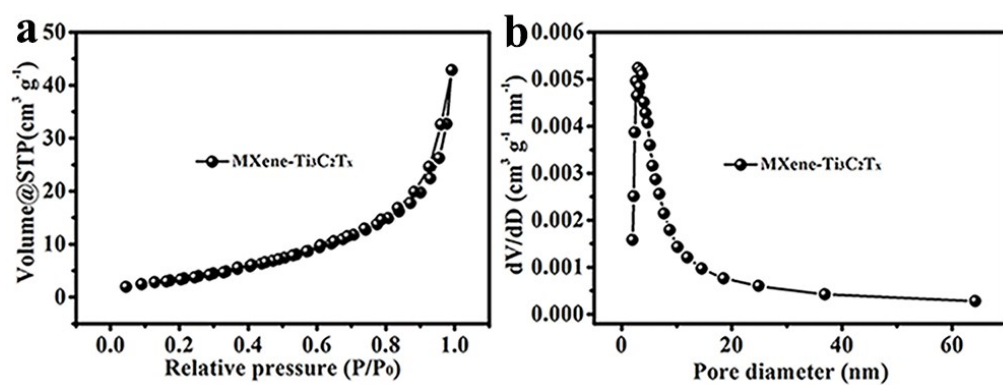
**Fig. S3** High-magnification TEM image of  $\text{Bi}_2\text{S}_3/\text{MXene}$  composite.



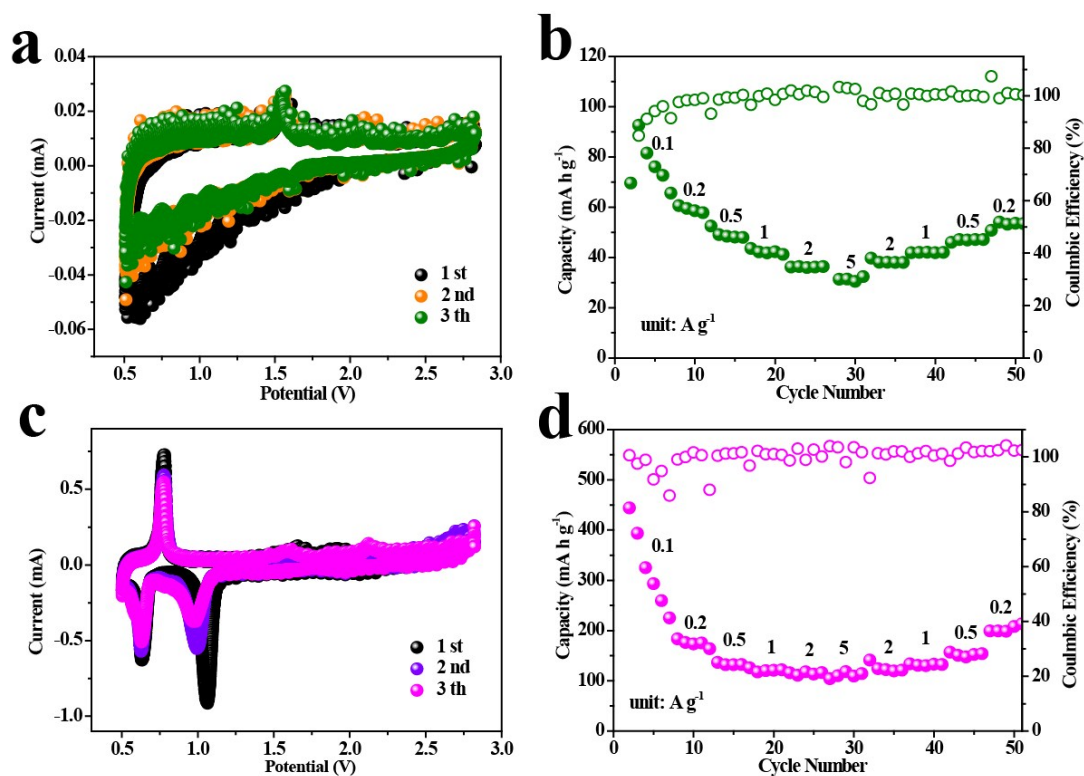
**Fig. S4** EDS mapping images of Bi, S, Ti, C for  $\text{Bi}_2\text{S}_3/\text{MXene}$  composite.



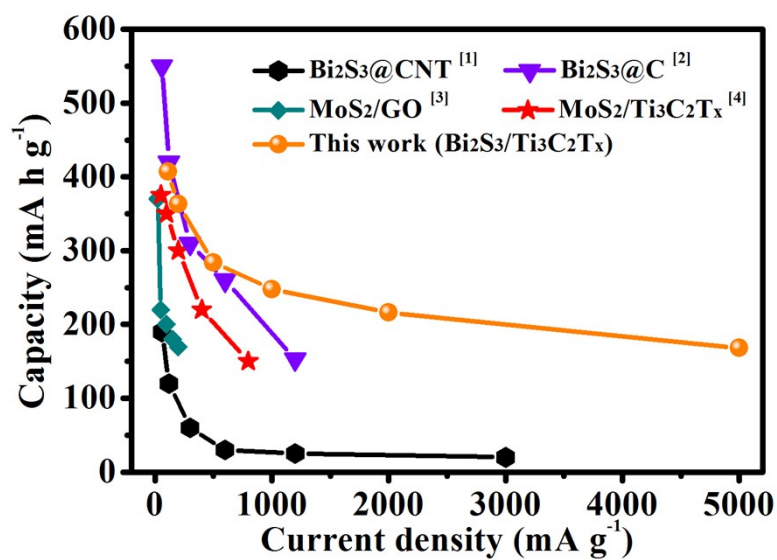
**Fig. S5** XRD pattern of (a) MXene sheets and (b) pure  $\text{Bi}_2\text{S}_3$ .



**Fig. S6** BET adsorption-desorption isotherm and pore size distribution of  $\text{Ti}_3\text{C}_2\text{T}_x$ .



**Fig. S7.** CV curves of (a) MXene and (c)  $\text{Bi}_2\text{S}_3$  at a scan rate of  $0.1 \text{ mV s}^{-1}$ . The rate performance of (b) MXene and (d)  $\text{Bi}_2\text{S}_3$ .



**Fig. S8.** Rate contrast between the published literatures and the Bi<sub>2</sub>S<sub>3</sub>/MXene composite electrode developed in this work.

**Table S1**

The electrochemical impedance fitting results.

| Samples                               | Rct/ $\Omega$ | Zw/ $\Omega$ | D <sub>Na</sub> <sup>+</sup> /cm <sup>2</sup> s <sup>-1</sup> |
|---------------------------------------|---------------|--------------|---------------------------------------------------------------|
| Bi <sub>2</sub> S <sub>3</sub> /MXene | 6.63          | 7.8          | $2.44 \times 10^{-10}$                                        |
| Bi <sub>2</sub> S <sub>3</sub>        | 49.45         | 348.8        | $1.76 \times 10^{-11}$                                        |

#### Reference

- [1] W. Yang, H. Wang, T. Liu, L. Gao, Mater. Lett., 2016, **167**, 102.
- [2] W. Li, C. Han, S. Chou, J. Wang, Z. Li, Y. Kang, H. Liu, S. Dou, Eur. Phys. J. A, 2016, **22**, 590.
- [3] L. David, R. Bhandavat, G. Singh, ACS nano, 2014, **8**, 1759.
- [4] G. Du, M. Tao, W. Gao, Y. Zhang, R. Zhan, S. Bao, M. Xu, Inorg. Chen. Front., 2019, **6**, 117.