Effect of the Number of Atomic Layers in 2D SnO on Na Ion Battery Performance

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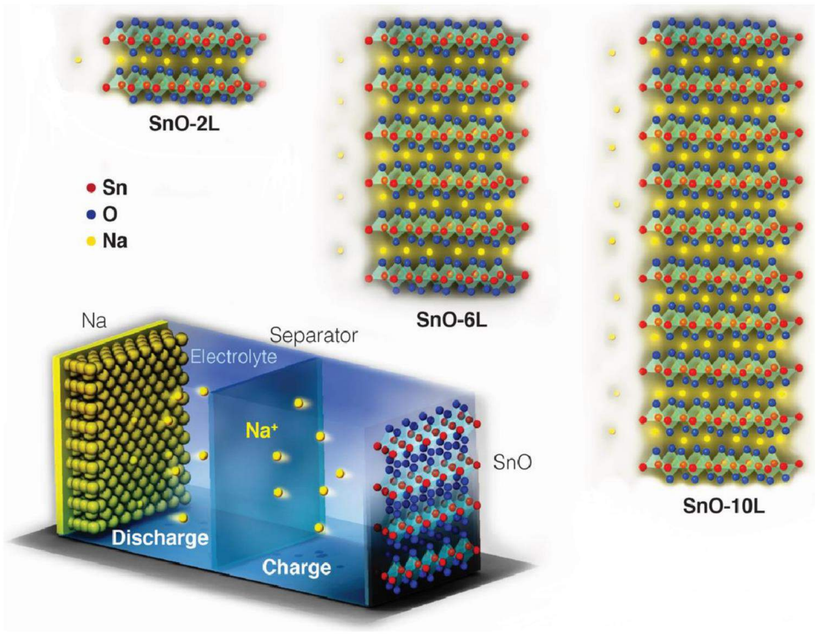
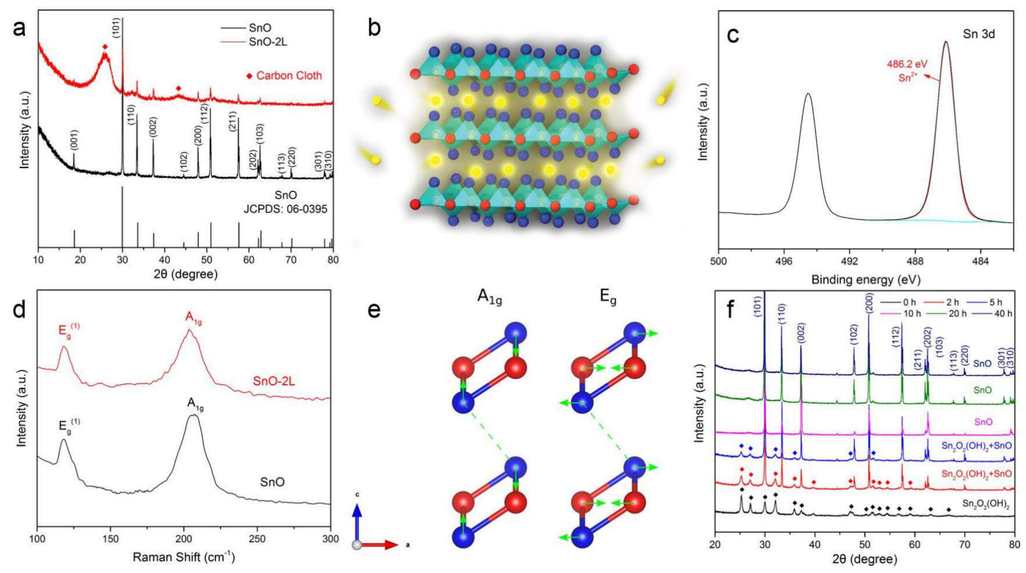
INTRODUCTION



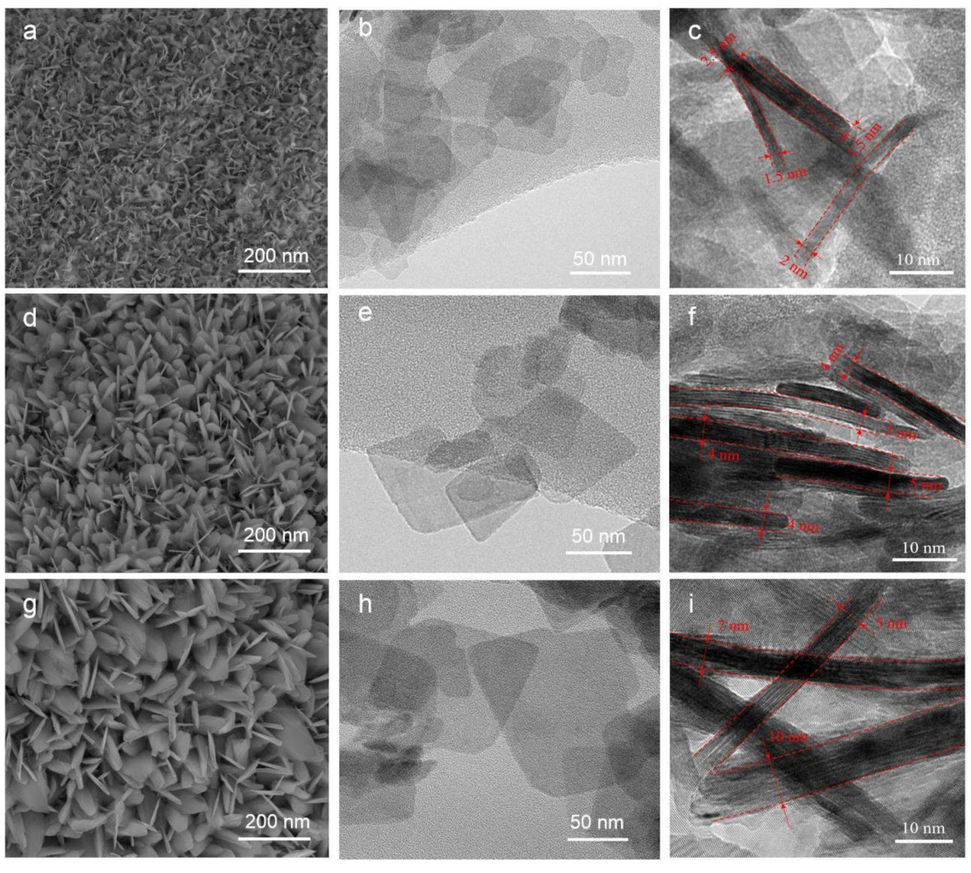
- SnO is a kind of layered metal oxide, with high theoretical capacity of 1150mAh/g as anode materials for sodium ion batteries (SIBs).
- Many physical and electrochemical properties of 2D materials depend strongly on the nanosheet dimensions.
- We used chemical synthesis to prepare SnO nanosheets with controlled number of atomic layers and lateral size, and studied how these changes affect SnO properties and electrochemical performances as SIB anodes.

MATERIAL CHARACTERIZATION



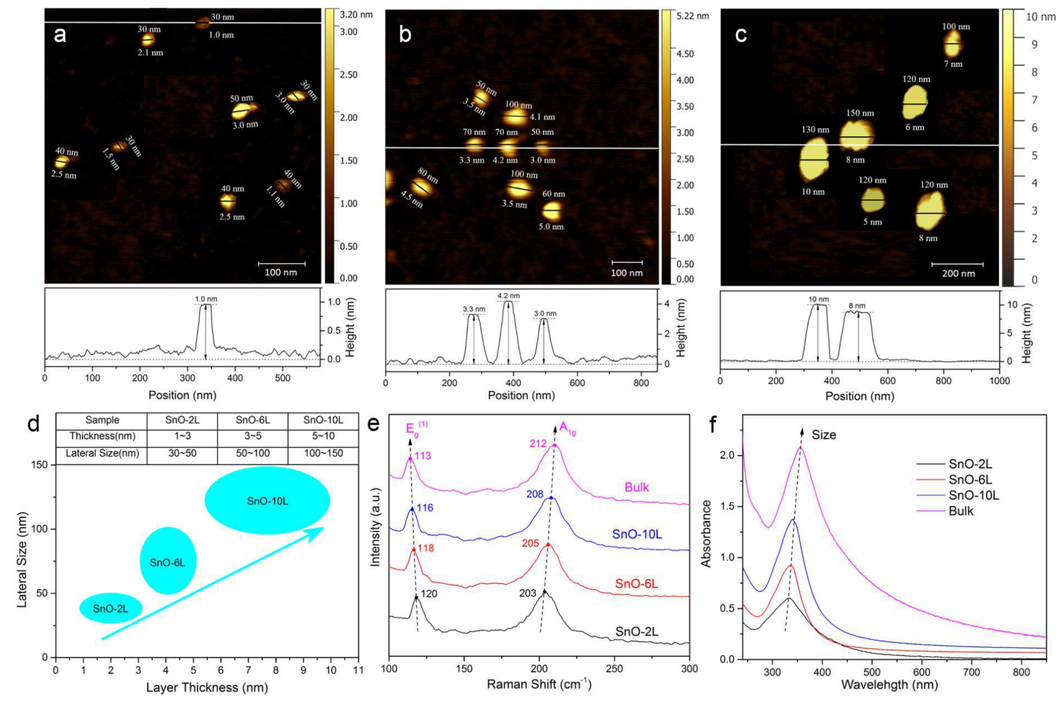
- XRD, Raman and XPS tests have been utilized to demonstrate the successful synthesis of pure SnO powder and SnO@CC with different layers.

MORPHOLOGIES OF DIFFERENT LAYERED SNO NANOSHEETS



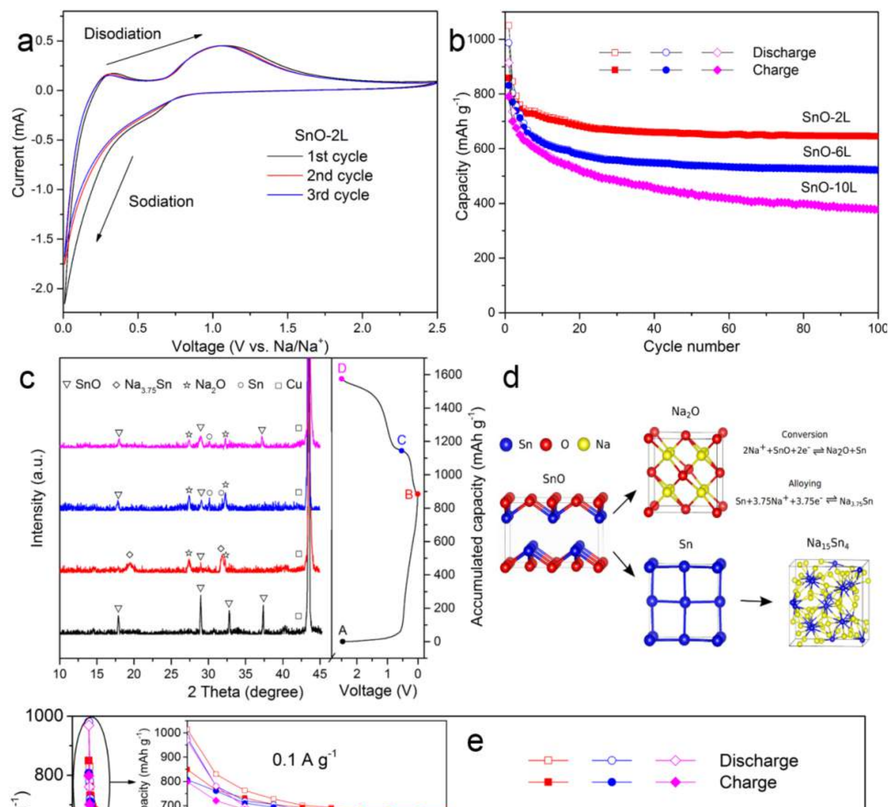
- Figure a, b and c: SnO with 2-6 layers and lateral size of 30-50 nm, is referred as SnO-2L (reaction time is 10 h).
- Figure d, e and f: SnO with 6-10 layers and lateral size of 50-100 nm, is referred as SnO-6L (reaction time is 20 h).
- Figure g, h and i: SnO with 10-20 layers and lateral size of 100-150 nm, is referred as SnO-10L (reaction time is 40 h).

CHARACTERIZATIONS OF DIFFERENT LAYERED SNO NANOSHEETS



- Figure a-c: AFM micrographs with corresponding thickness and lateral size measurements of SnO-2L, SnO-6L and SnO-10L, respectively;
- Figure d: Thickness and lateral size distributions of three samples;
- Figure e and f: Raman spectrum and UV-absorbance spectrum of samples containing different nanosheet size.

ELECTROCHEMICAL PROPERTIES



- Figure a: CV curves of SnO-2L nanosheet electrodes;
- Figure b: Cycling performances of SnO-2L, SnO-6L and SnO-10L nanosheet electrodes at 0.1 A/g for 100 cycles;
- Figure c and d: *Ex-situ* XRD profiles of bare SnO electrode over the first charge/discharge cycle and the corresponding reaction mechanism.
- Figure e: Long-term cycle stabilities of SnO-2L, SnO-6L and SnO-10L electrodes at 1 A/g for 1000 cycles

CONCLUSIONS

- SnO nanosheets with controlled number of atomic layers were chemically prepared and systematically studied;
- The number of atomic layers in SnO nanosheets was found to significantly influence their physical and electrochemical properties;
- The thinnest SnO nanosheet (< 6 SnO monolayers) anodes exhibited the best performance.

REFERENCES

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