

---

## Zhengxuan Yin

Chenchen Wang, Kaixiang Lei, Fujun Li

Key Laboratory of Advanced Energy Materials Chemistry (Ministry of Education), College of Chemistry, Nankai University, Tianjin 300071, PR China

fujunli@nankai.edu.cn

---

# High Na/K-storage performance of bismuth enabled by ether-based electrolytes

## Abstract

Sodium and potassium-ion batteries have attracted extensive attention due to the abundance and low cost of sodium and potassium resource. However, large size of Na<sup>+</sup>/K<sup>+</sup> and formation of dendrite make it hard to find appropriate anode materials. Alloying anodes provide high capacity and modest voltage but suffer from large volume change and pulverization. Here, we reported bulk bismuth with excellent Na/K-storage performance enabled by ether-based electrolytes. During cycling, the electrode undergoes reversible phase reactions of Bi ↔ NaBi ↔ Na<sub>3</sub>Bi and KBi<sub>2</sub> ↔ K<sub>3</sub>Bi<sub>2</sub> ↔ K<sub>3</sub>Bi, respectively. In ether-based electrolytes, a stable solid electrolyte interface is formed and the morphology of the electrode also gradually develops into a porous network, realizing fast kinetics and tolerance of its volume change. Both stable solid electrolyte interface and porous morphology contribute to the good performance in sodium-ion battery and potassium-ion battery. This interplay between electrolyte and electrode to boost Na/K-storage performance will pave a new way in energy storage.

## References

- [1] Kaixiang Lei, Chenchen Wang, Luojia Liu, Yuwen Luo, Chaonan Mu, Fujun Li, and Jun Chen *Angew .Chem.* 2018, 57,4687–469
- [2] Chenchen Wang, Liubin Wang, Fujun Li, Fangyi Cheng, and Jun Chen *Adv. Mater.* 2017, 29, 1702212