

Article

Electrolyte Solvation Structure Manipulation and Synthetic Optimization for Enhanced Potassium Storage of Tin Phosphide/Carbon Alloy-Based Electrode

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Table S1. Parameters of ball milling. The bold number is reference value. That means a time of 10 h, a speed of 500 rpm, a ratio of 30: 1, and a ball size of 10 mm. When one parameter is used as a variable, the value of other parameters is fixed as the reference value.

Parameter	Values		
Time(h)	10	20	30
Speed(rpm)	400	500	600
Ratio(ball: materials)	15:1	30:1	60:1
Ball size(mm)	2	5	10

Table S1 describes nine different ball milling parameters conditions.

1) **2mm**, 30h, 30:1, 500rpm.

2) **5mm**, 30h, 30:1, 500rpm.

3) 10mm, 30h, 30:1, 500rpm.

4) 10mm, **10h**, 30:1, 500rpm.

5) 10mm, **20h**, 30:1, 500rpm.

6) 10mm, 30h, **15:1**, 500rpm.

7) 10mm, 30h, **60:1**, 500rpm.

8) 10mm, 30h, 30:1, **400rpm**.

9) 10mm, 30h, 30:1, **600rpm**.

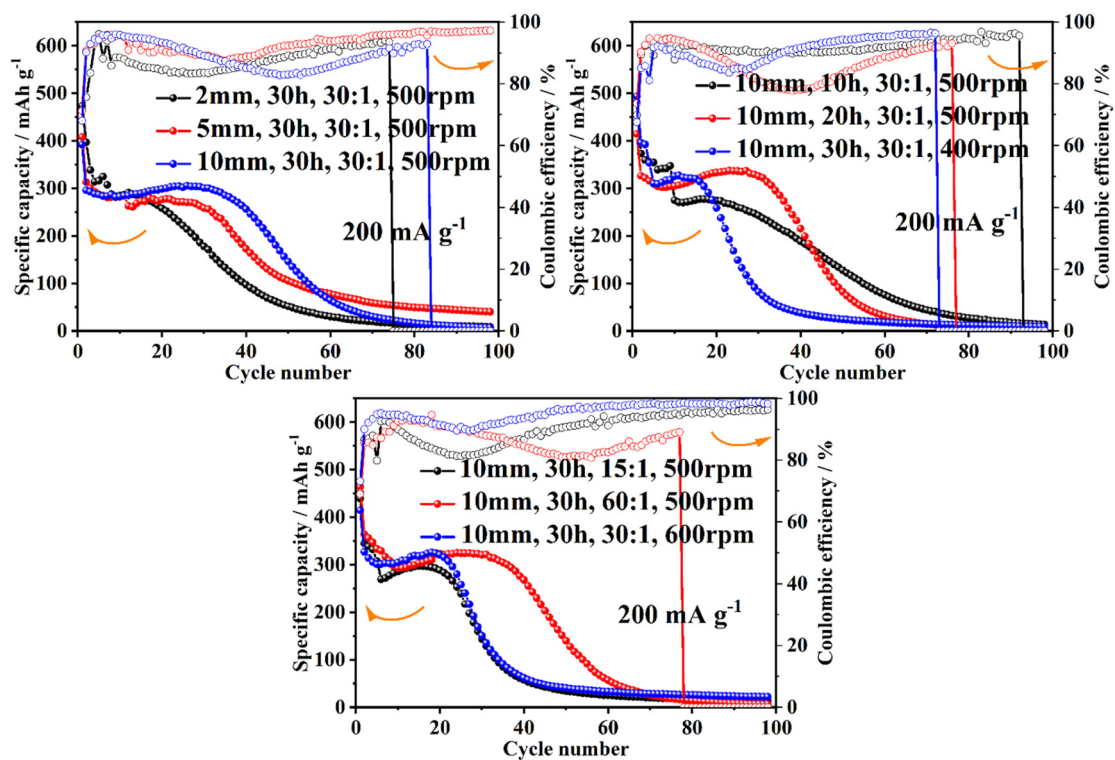


Figure S1. Cycling performance of the $\text{Sn}_4\text{P}_3/\text{C}$ electrodes in PIBs at the current density of 200 mA g^{-1} .

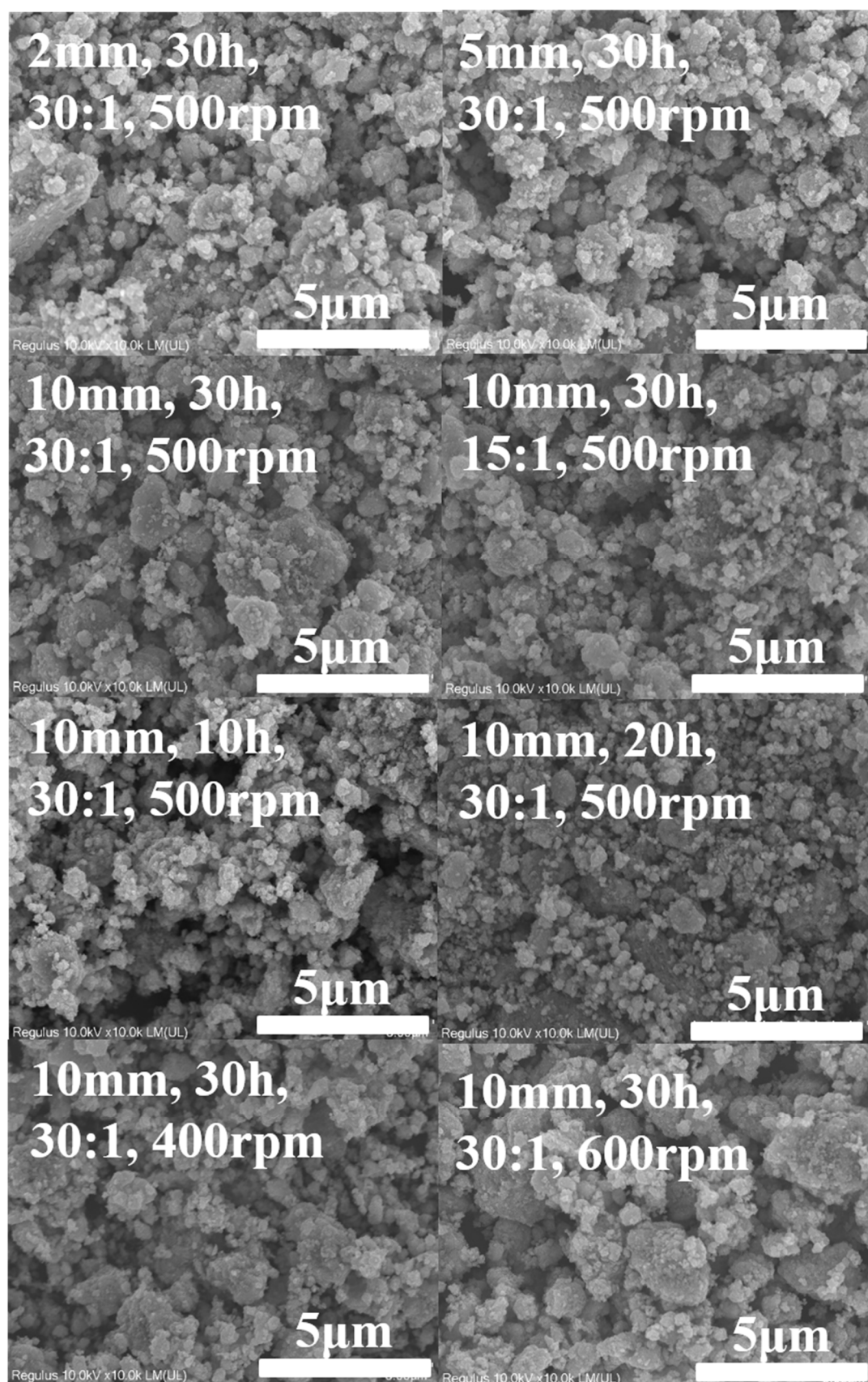


Figure S2. SEM images of Sn₄P₃/C composites under different ball milling parameters.

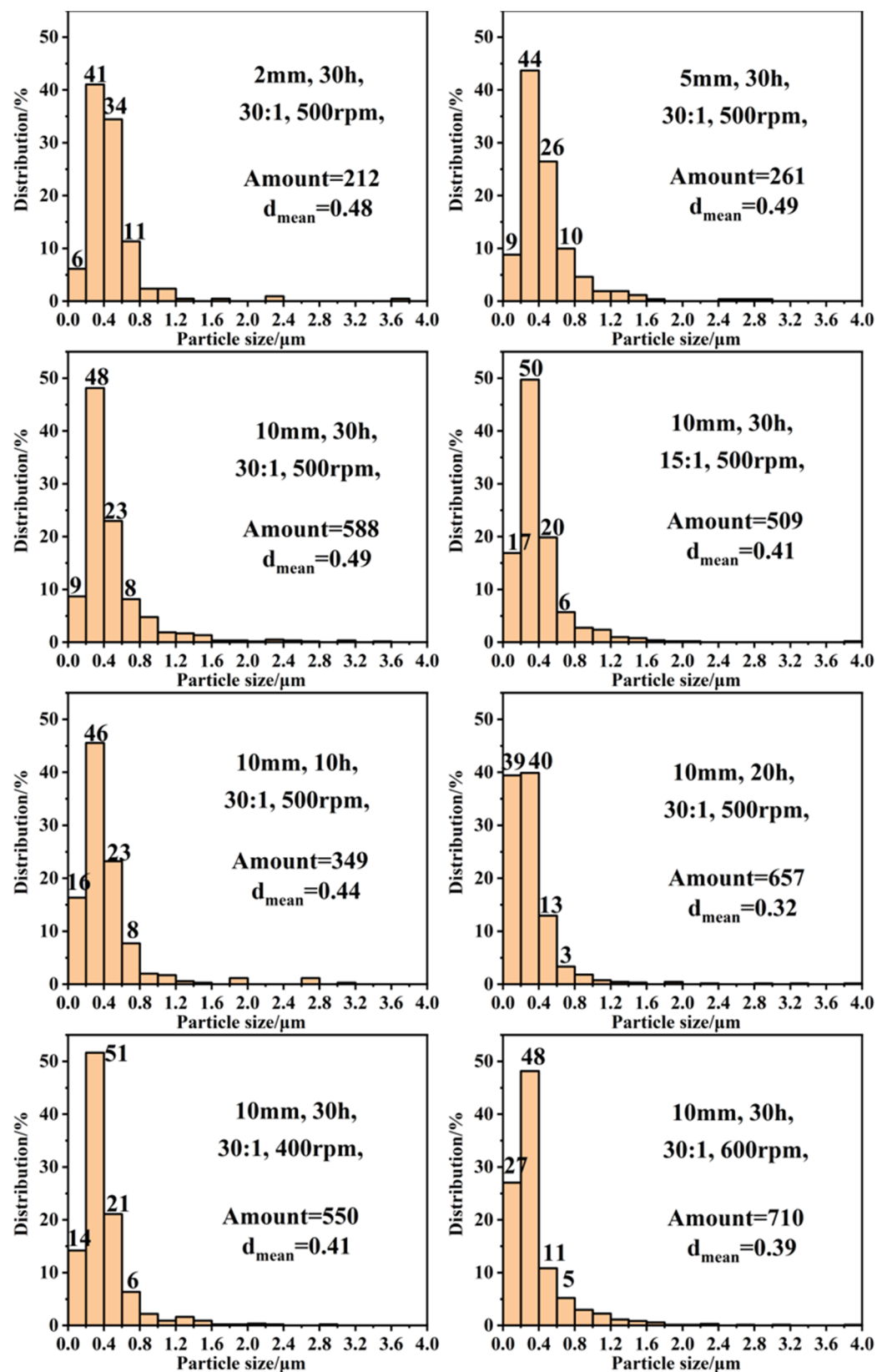


Figure S3. Particle size distribution of $\text{Sn}_4\text{P}_3/\text{C}$ composites under different ball milling parameters.

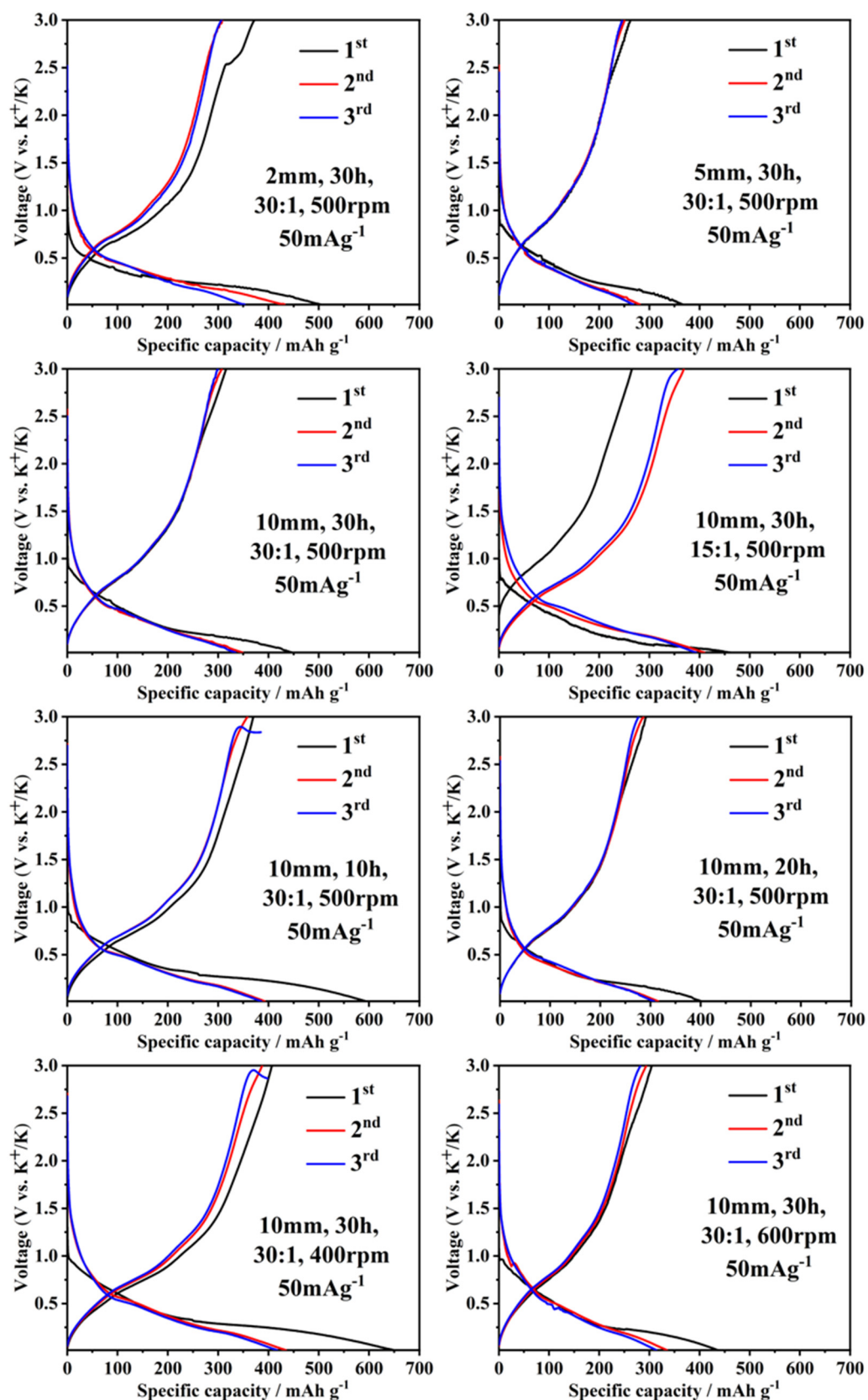


Figure S4. The first, second and third discharge/charge profiles of PIBs with $\text{Sn}_4\text{P}_3/\text{C}$ at the current density of 50 mA g^{-1} .

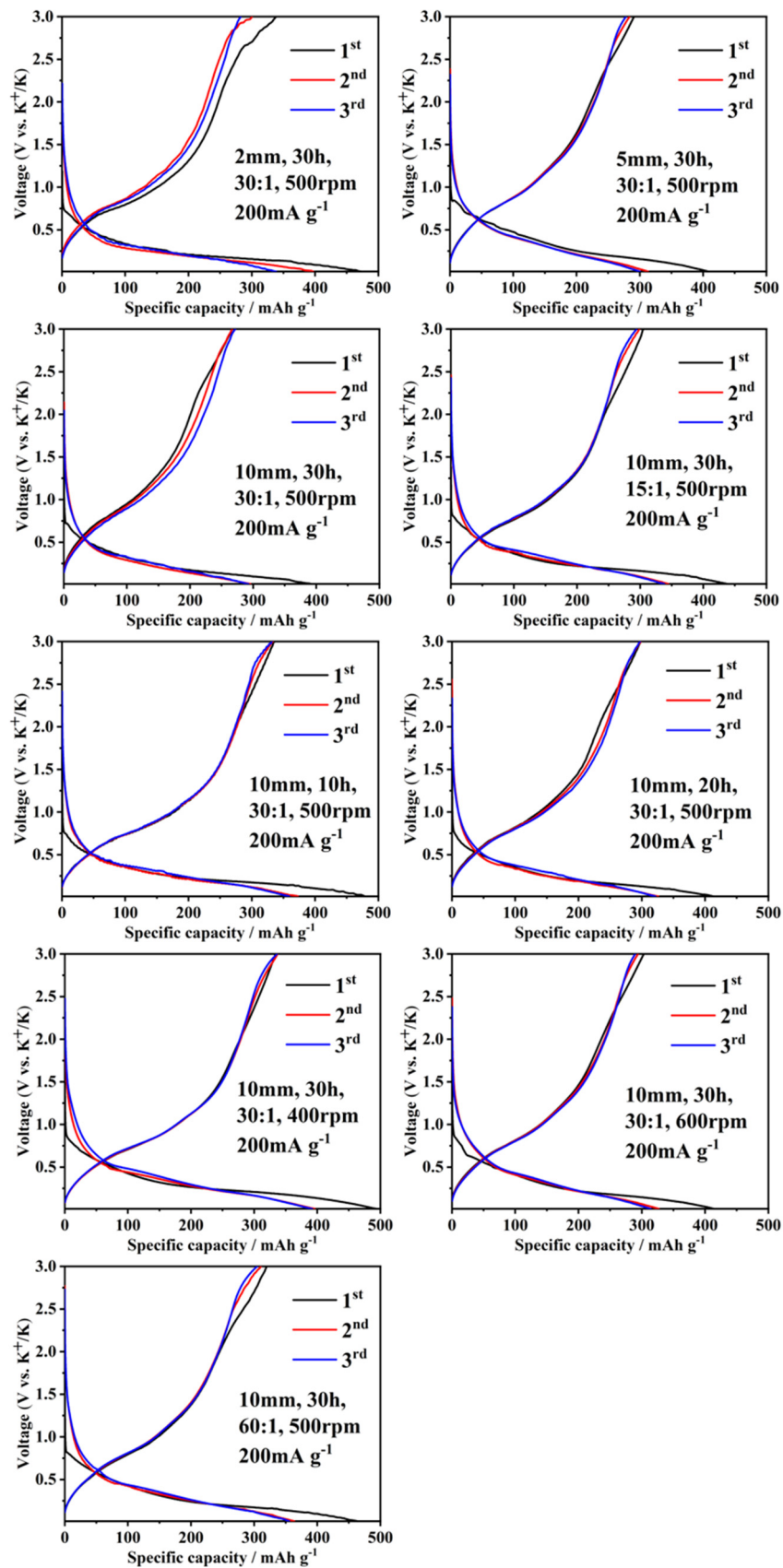


Figure S5. The first, second and third discharge/charge profiles of PIBs with $\text{Sn}_4\text{P}_3/\text{C}$ at the current density of 200 mA g^{-1} .

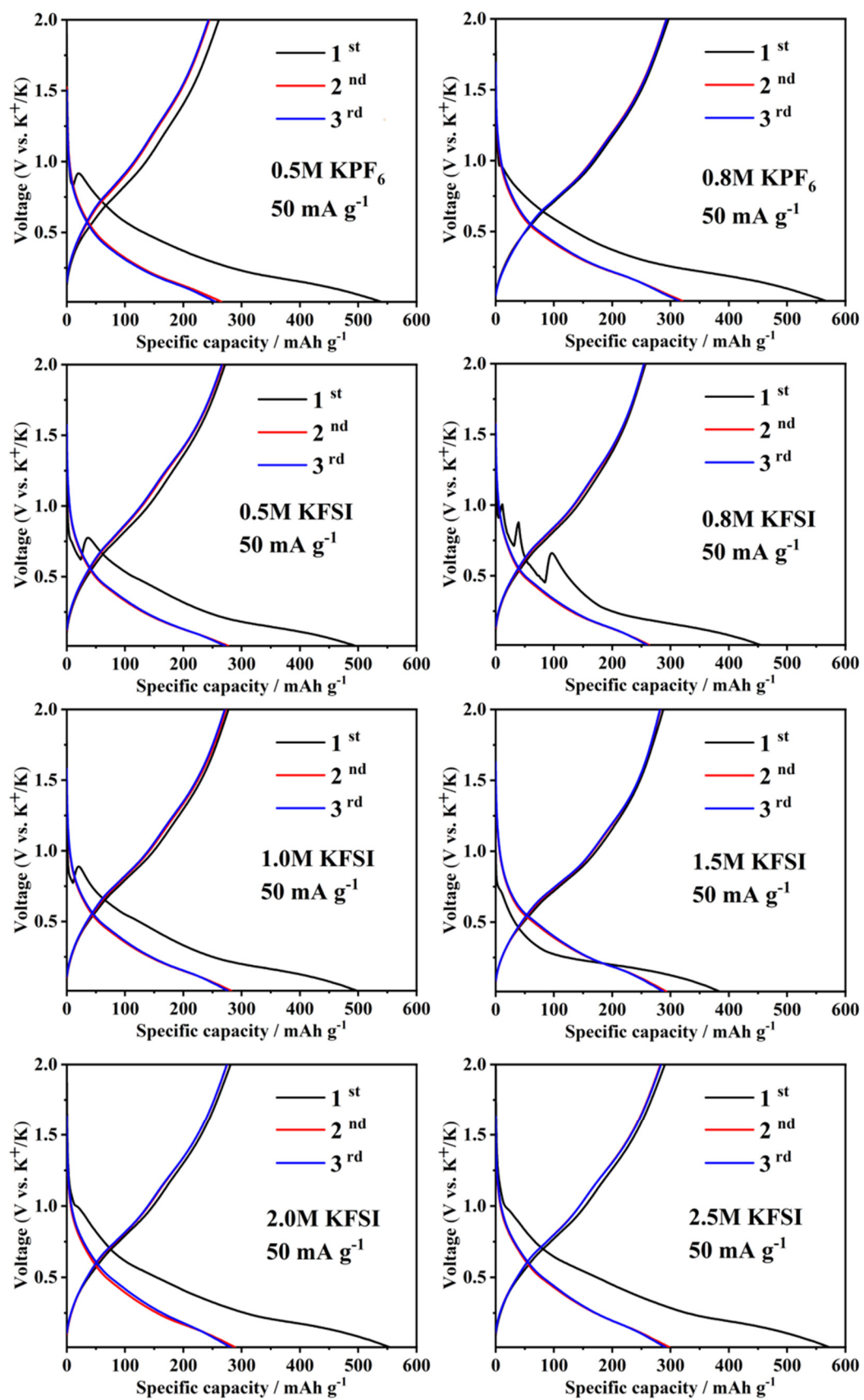


Figure S6. The initial, second, and third discharge/charge profiles of $\text{Sn}_4\text{P}_3/\text{C}$ anode with different electrolyte at 50 mA g^{-1} current density.

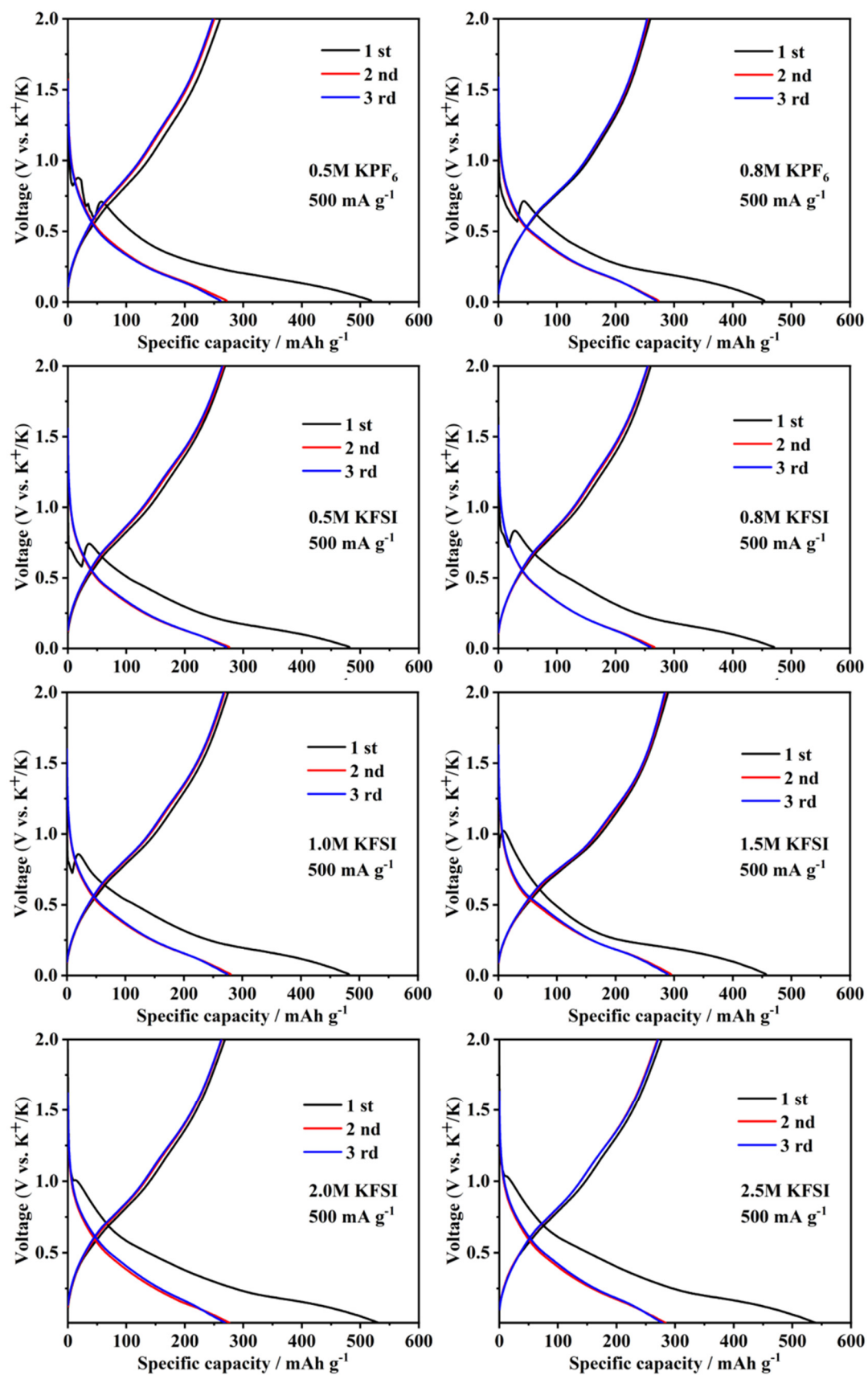


Figure S7. The initial, second, and third discharge/charge profiles of $\text{Sn}_4\text{P}_3/\text{C}$ anode with different electrolyte at 500 mA g^{-1} current density.

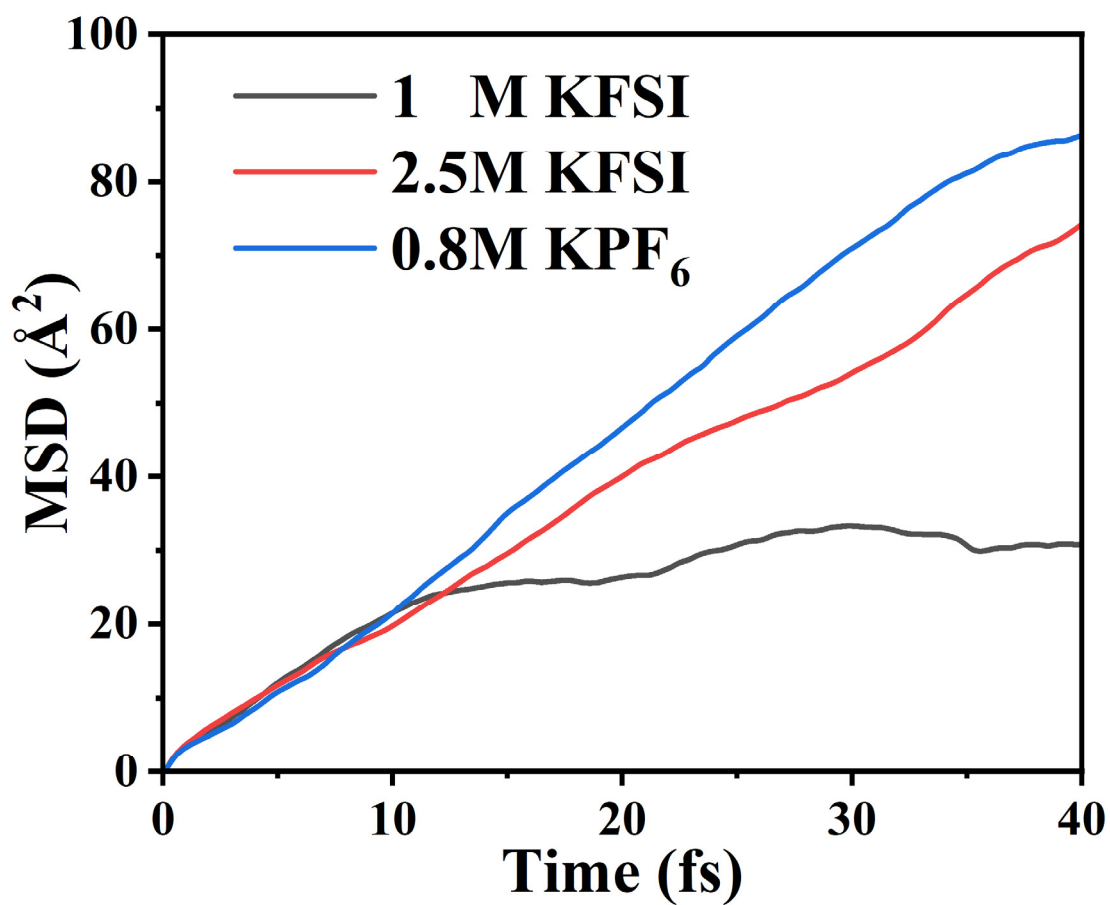


Figure S8. Mean Square Displacement (MSD) of K^+ in different electrolytes.

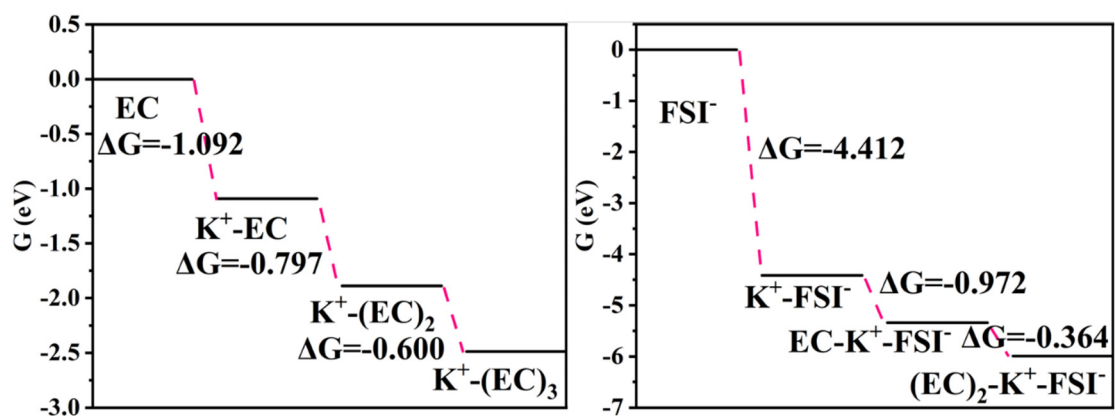


Figure S9. Gibbs free energy of K^+-EC and K^+-FSI .