

Background

At present, the shortage of lithium resources and high price limit the large-scale use of the lithium-ion battery. In recent years, aluminum-ion batteries (AIBs) have drawn increasing attention in the field, expected to substitute the rechargeable lithium-ion batteries as a new secondary energy storage system.

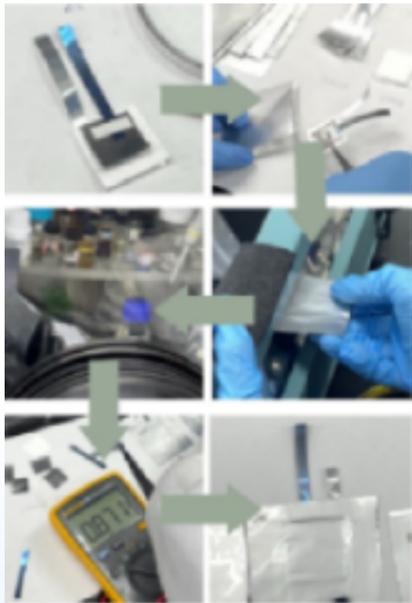
Motivation

- * Al is abundant in storage
- * Al is save to use
- * Al is light in quality
- * Find approaches to deal with dendrite formation

Hypothesis

- * Optimizing the electrolyte with simple heat treatment with Al metal
- * Optimizing the electrode with using Al deposited on carbon cloth (CC) as anode

Preparations



Battery Preparation



Electrolyte Preparation



Anode Preparation

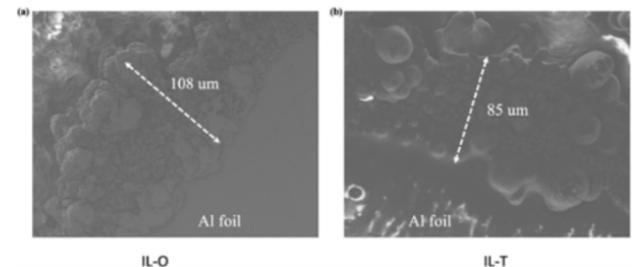
Remark of Andoe Preparation :

(left) Aluminum and (right) Carbon Cloth used in aluminum-ion battery as Anode.

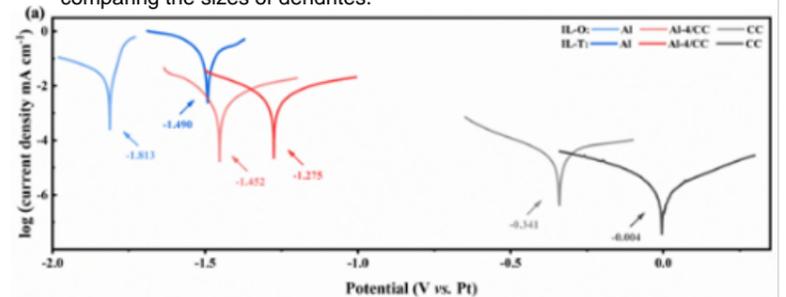
Remarks of Electrolyte Preparation:

1. mixing AlCl_3 and $[\text{EMIm}]\text{Cl}$ with a mole ratio of 1.3:1
2. treated with high-purity Al metal at 120 degree ceisius for 24 hours

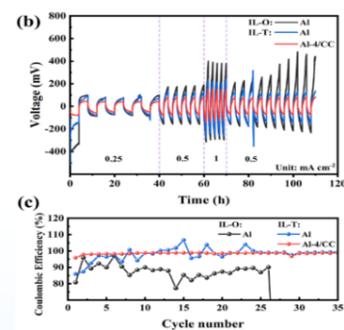
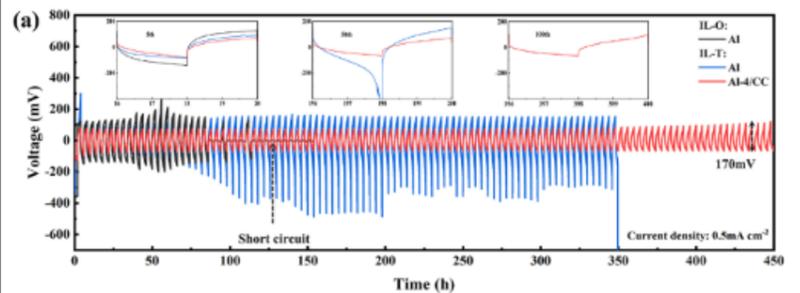
Outcomes



SEM images of (left) Al anode and (right) Al4/CC anode, comparing the sizes of dendrites.



Potentiodynamic polarization curves using three-electrode configuration showing the corrosion of different electrodes.



Remarks:

- Based on Al and Al4/CC anodes with IL-O and IL-T electrolyte, a) Voltage profiles of symmetric cells at 0.5 mA cm². b) Rate performance of the symmetric cells at current densities from 0.25 to 1 mA cm². c) Coulombic efficiencies

Conclusion

- * cycling 450h with smoother plateaus
- * high CE (99.7%)
- * Al4/CC || graphite's superb capacity (61 mAh g⁻¹)