

Study of Mg Batteries: Electrolyte, Current Collectors and Their Compatibility

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Advanced rechargeable batteries are needed and have been developed extensively to meet energy storage demands of both electric vehicles and stationary energy storage systems.^[1-2] Li-ion batteries, widely used in portable electronic devices and small-scale stationary energy storage systems, are still beyond the scope of large energy storage requirements due to resource scarcity, safety issues, and cost barriers. Recently, magnesium batteries have attracted great interest due to their high energy density and environmentally friendly components, along with magnesium's low cost (~\$ 2700/ton for Mg compared to \$64,000/ton for Li) and high abundance (~13.9% Mg compared to ~0.0007% of Li), and been suggested as a potential cheap but good-performing battery candidate for large energy storage applications.^[2-6] Despite these attractive attributes of Mg batteries, there are still challenges relating to cathodes, electrolytes, anodes, and current collectors.^[2, 7-9] To date, electrolyte of organohaloaluminate/ether enable the reversible magnesium deposition/dissolution, but the low electrochemical/chemical stability and narrow electrochemical window of these electrolyte limit the development and evaluation of new cathode materials. Besides the study of cathode and anode materials, incompatibility between the electrolyte and current collectors, which may be related to the chemical instability of the Grignard reagent-based electrolyte, is also an important factor for designing a rechargeable Mg battery with a long cycle life. Therefore, synthesis of stable and high efficiency electrolyte and understanding the electrochemical behavior of current collectors in the electrolyte are critical for development of anode, cathode, and ultimately the system of Mg batteries. Aiming to address these issues in Mg batteries, we carried out systematical studies on the synthesis of new electrolyte and its compatibility with the current collectors, and will present our results at the meeting.

References

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