Anodic Oxidation of Pure Zinc Sheet and Its Application in Aqueous Zinc Ion Batteries

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Abstract Zinc-ion batteries have gained significant attention as a promising alternative to lithium-ion batteries due to their abundant resources and cost-effectiveness. However, a major challenge with zinc anode is the growth of dendrites, which can lead to undesirable side reactions and reduce battery lifespan. Ensuring the corrosion resistance of the zinc surface is crucial for improving battery performance and longevity. In this study, we investigated the anodic oxidation of zinc to grow ZnO nanorods on the zinc electrode surface. By optimizing parameters such as electrolyte concentration, voltage, and reaction time, we successfully produced ZnO nanorods over 535 nm in length using a 75 mM electrolyte at 20 V for 10 minutes. This ZnO coating significantly enhances the electrode's corrosion resistance, resulting in a substantial improvement in battery performance, with the modified zinc electrode achieving a capacitance retention rate of 88.01% after 500 cycles. These findings underscore the effectiveness of ZnO modifications in extending the life and efficiency of zinc-ion batteries.

Keywords Zinc-ion batteries; anodic oxidation; zinc anode; corrosion resistance; ZnO nanorods.

Reference

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