

How can etching conditions be optimized?

By optimizing the concentration and etching duration, the ideal etching conditions are obtained. The etched Zn foil has a 3D structure, which is conducive to inducing uniform deposition and stripping of Zn²⁺, and reducing the formation of zinc dendrites.

Does etching Zn foil with acid solution improve battery cycle stability?

Whether it is inorganic acid or organic acid to etch Zn foil, the etched Zn anode can exhibit better electrochemical performance than bare Zn, indicating that etching Zn foil with acid solution is universal. Furthermore, the mechanism of Zn anode etched with acid solution to improve battery cycle stability can be briefly described as follows.

Why is the etching process important?

Therefore, the etching process is an important part of constructing a 3D Zn anode to form a high-speed ion/electron transport dual-channel. It plays a fundamental role in achieving faster kinetics and more stable electrochemical performance of Zn anodes.

Why is the etching process important in a 3D Zn anode?

At the same time, it can also ensure the orderly electrochemical reduction of Zn to form porous structure after annealing. Therefore, the etching process is an important part of constructing a 3D Zn anode to form a high-speed ion/electron transport dual-channel.

What is Zn etching?

In a sense, the essence of etching is a solid-liquid reaction based on chemical corrosion. The micromorphology and structure of Zn anodes can be controlled by adjusting the etching time, concentration and temperature with different etchants.

Does etching increase Zn affinity and improve corrosion resistance?

Reproduced from Ref. with permission from Elsevier. These studies have shown that the construction of inert metal or compound layer on the surface of the Zn anode by etching reaction can indeed increase the Zn affinity and improve the corrosion resistance. Bismuth (Bi) is also a common inert metal used for Zn anode protection.

2 ???· This review outlines general methodologies and mechanisms by which selective etching can be applied to create nanomaterials, including various template-assisted, facet ...

Silicon nanowires (SiNWs) have demonstrated great potential for energy storage due to their exceptional electrical conductivity, large surface area, and wide compositional range. Metal-assisted chemical etching (MACE) is a widely used top-down technique for fabricating silicon micro/nanostructures.

Columbia Engineering material scientists have been focused on developing new kinds of batteries to transform how we store renewable energy. In a new study recently published by Nature Communications, the team used K-Na/S batteries that combine inexpensive, readily-found elements -- potassium (K) and sodium (Na), together with sulfur (S) -- to ...

Alkali etching reacts with materials to form new chemical bonds and improve the electrochemical performance of the separator ... Wen J et al (2022) Research progress on high-temperature resistant polymer separators for lithium-ion batteries[J]. Energy Storage Mater 51:638-659. Article Google Scholar Yu J, Dong N, Liu B et al (2022) A newly-developed heat ...

Numerous energy storage parts can benefit from valuable and unique properties of MXenes. MXenes serve a variety of purposes in batteries and supercapacitors, including substrates for electrodeposition, steric hindrance, ion redistribution, bilayer and oxidation/reduction ion storage, ion transfer regulation, and more.

Herein, we propose an in-situ micro-battery etching strategy to fabricate an amorphous Zn²⁺-intercalated ammonium vanadate coated 3D porous Zn anode (3D Zn@A-ZNVO), which exploits the synergistic effects of surface coating and 3D structure. This one-pot preparation strategy is simple in process and significantly reduces the production cost. As ...

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The production line includes a complete set of process equipment for battery cell rework, including adhesive removal from battery cell structures, film peeling, automatic wrapping, and electrode ...

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