Effect of acid etching of stainless-steel foils in rechargeable lithium-ion batteries

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Research into rechargeable aqueous batteries is driven by the need for low-cost, high-safety batteries for large-scale energy storage applications. The effect of current collectors on battery performance is frequently disregarded, despite the fact that the majority of research efforts concentrate on creating electrolyte formulations and electrode materials.

A commonly used current collector in aqueous batteries is stainless steel foil, which has the benefits of being inexpensive, good conductivity, good flexibility, lightweight, and more. The difficulty in shedding active materials and high contact resistance that stainless steel foil encounters as a current collector, however, remain. In this work, the surface of stainless-steel foil is modified by chemical etching, and the influence of surface morphology of stainless-steel foil on battery performance is investigated.

The chemical etching technique was successfully used to modify stainless steel foil. The surface of modified stainless-steel exhibits evenly spaced defects (etching pits). The improved stainless steel foil's moderate roughness, effective contact area, and good electrical conductivity are all made possible by the formation of defects. The results show that the stainless-steel foil treated with 1M HCl etching solution for 10 min has the best electrochemical performance.

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