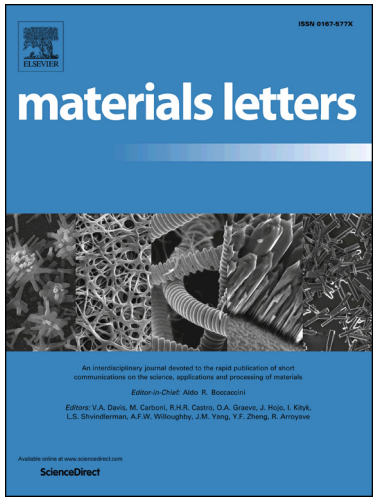

Powder-sintering derived 3D porous current collector for stable lithium metal anode

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Powder-sintering derived 3D porous current collector for stable lithium metal anode

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Abstract: Lithium metal, own to high capacity, negative potential and good conductivity, has a huge application prospect for next-generation lithium batteries. Nevertheless, its commercialization is largely hindered by volume expansion and Li dendrites. In this work, we employ a low-cost and scalable powder-sintering method to obtain 3D porous Cu-Zn alloy, which can be used as a host material to induce dendrite-free Li deposition. 3D porous Cu-Zn alloy renders high surface areas, uniform spatial structure and even the good lithiophilicity, resulting in low Li deposition interface energy and low lithium deposition barrier. As a result, 3D porous Cu-Zn alloy electrode exhibits a superior Coulombic efficiency of 98.3% for 160 cycles at 1.0 mA/cm^2, whereas the Coulombic efficiency of Cu foil electrode quickly drops to less than 80.0% only after 55 cycles. In addition, 3D porous Cu-Zn alloy electrode still runs stably for 45 cycles at 10.0 mA/cm^2, and even at a high deposition capacity of 5.0 mAh/cm^2. Therefore, powder-sintering derived 3D porous Cu-Zn alloy may provide innovative insights of electrode designs for next-generation metallic lithium anodes.

Keywords: Metallic composites; Electrodeposition; Energy storage and conversion; Porous materials

1. Introduction

Lithium metal with high theoretical capacity of 3860 mAh/g, more than 10 times that of graphite anode at the lowest redox potential of all materials, is the most promising anode materials

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