ZnO Nanorods Grown Directly on Copper Foil Substrate as a Binder-Free Anode for High Performance Lithium-Ion Batteries

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ZnO nanorods directly grown on copper foil substrate were obtained via hydrothermal method without using templates. Structure and morphology of the as-prepared ZnO nanorods were characterized by X-ray diffraction, scanning electron microscopy and high-resolution transmission electron microscopy. The ZnO nanorods on copper foil (ZnO@CF) exhibited remarkably enhanced performance as anode for lithium batteries with the initial discharge capacity of 1236 mAh g⁻¹ and a capacity of 402 mAh g⁻¹ retained over 100 cycles at a current density of 200 mA g⁻¹. The ZnO@CF anode demonstrated an excellent rate capability, delivering a reversible capacity of 390 mAh g⁻¹ at 1500 mA g⁻¹. This superior performance of the ZnO@CF anode is believed to be due to the unique structure of this binder-free anode, favoring mass and charge transfer at its interface with the electrolyte, effectively reducing the Li-ions diffusion paths and providing conditions to accommodate the anode volume variations upon charge-discharge cycling.

Keywords: Lithium ion battery, Anode, ZnO nanorods, Binder-free

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