April 7 - 11, 2025
Seattle, Washington

Symposium Sessions

Presentations

Tutorial Sessions

2025 MRS Spring Meeting & Exhibit

EN01.10.17

Potassium-Rich Iron Hexacyanoferrate/Carbon Cloth Electrode for Flexible and Wearable Potassium-Ion Batteries

When and Where

Apr 9, 2025
5:00pm - 7:00pm

Summit, Level 2, Flex Hall C

Presenter(s)

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Abstract

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The fast development of flexible and wearable electronics increases the demand for flexible secondary batteries,

and the emerging high-performance K-ion batteries (KIBs) have shown immense promise for the flexible electronics due to the abundant and cost-effective potassium resources. However, the implementation of flexible cathodes for KIBs is hampered by the critical issues of low capacity, rapid capacity decay with cycles, and limited initial Coulombic efficiency. To address these pressing issues, a freestanding K-rich iron hexacyanoferrate/carbon cloth (KFeHCF/CC) electrode is designed and fabricated by cathodic deposition. This innovative binder-free and self-supporting KFeHCF/CC electrode not only provides continuous conductive channels for electrons, but also accelerates the diffusion of potassium ions through the active electrode–electrolyte interface. Moreover, the nanosized potassium iron hexacyanoferrate particles limit particle fracture and pulverization to preserve the structure and stability during cycling. As a result, the K-rich KFeHCF/CC electrode shows a reversible discharging capacity of 110.1 mAh g−1 at 50 mA g−1 after 100 cycles in conjunction with capacity retention of 92.3% after 1000 cycles at 500 mA g−1. To demonstrate the commercial feasibility, a flexible tubular KIB is assembled with the K-rich KFeHCF/CC electrode, and excellent flexibility, capacity, and stability are observed.

Keywords
flexible cathode, good cycling stability, high capacity, K-rich iron hexacyanoferrate/carbon cloth, wearable potassium ion batteries

Keywords

Fe | scanning electron microscopy (SEM)

Symposium Organizers

Junjie Niu, University of Wisconsin--Milwaukee

Ethan Self, Oak Ridge National Laboratory
Shuya Wei, University of New Mexico
Ling Fei, The University of Louisiana at Lafayette

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Junjie Niu
Ethan Self

In this Session

EN01.10.13
Origins of Disorder and Stability for High-Entropy Rocksalt Li-Ion Battery Cathodes

EN01.10.03
Silicon Nitride Nanoparticles Synthesized in a Hot-wall Reactor for Battery Applications

EN01.10.07
Effect of Carbon Precursors on Resulting Electrode Performance

EN01.10.02
Double Transition Metal Nitride MXene as High-Capacity Stable Anode for Li-Ion Batteries and Beyond—Ab Initio and Machine Learning Force Field Study

EN01.10.30
Redox-Active Metal Complexes as Promising

Anode Materials for High-Performance Lithium-Ion Batteries

EN01.10.06

Free-Standing (Current Collector-Free, Binder-Free and Conductive Additive-Free Binder-Free) Anode Architecture Based on Hierarchical Carbon Nanofiber Networks for Lithium-Ion Batteries

EN01.10.29

Investigation of Vanadium Pentoxide–Sulfur Cathodes for Enhanced Lithium–Sulfur Battery Performance

EN01.10.16

Application of Highly Concentrated Electrolytes with Surfactant to High-Energy Lithium Metal Batteries with Pure Nickel Layered Oxides

EN01.10.20

Iron, Cobalt Co-Embedded Xerogel Derived Carbon as Cathode Host for Ultra-High-Rate Performance Lithium-Sulfur Batteries

EN01.10.18

Enhancing the Electrical Conductivity of Iron-Oxide-Based Anodes by Tin-Oxide-Based Coating for Lithium-Ion Batteries