Molybdenum Trioxide Embedded in a Novel Mo_2C-C Hetero-matrix with a Fibrous Structure for High Capacity and Long Life Lithium Ion Battery

Jing Cuan [a], You Zhou [b]
[a] *Institute for Superconducting & Electronic Materials*
Australian Institute of Innovative Materials, University of Wollongong,
Innovation Campus, Squires Way, Wollongong, NSW 2500, Australia
[b] *Faculty of Materials Science and Chemical Engineering, Ningbo University, Ningbo, 315211, China*

E-mail:*jc064@uowmail.edu.au*

Carbon is widely used for the stable cycling of electrode materials, however, due to the low theoretical capacity of carbon, the sacrifice of capacity is an issue worth noticing. In this work, MoO_3@Mo_2C-C composites with a novel Mo_2C-C hetero-matrix which contributes to higher capacity delivery, are fabricated for electrode materials. The influences of Mo_2C-C hetero-matrix with different thickness and phase compositions on electrochemical performances are systematically investigated. Among all MoO_3@Mo_2C-C composites, MoO_3@Mo_2C-1-C shows superior electrochemical performance with a high reversible capacity of 890 $mA{\cdot}h{\cdot}g^{-1}$ after 300 cycles at 1000 $mA{\cdot}g^{-1}$ and excellent cycling stability with almost 100 % capacity retention after 110 cycles at 200 $mA{\cdot}g^{-1}$. The superior electrochemical performance of MoO_3@Mo_2C-1-C could be attributed to the synergistic effect of the shortened ion diffusion path inside the heteronanofiber structure and enhanced electronic conductivity originated from the incorporation of C and Mo_2C in this heterostructures. This work highlights that through fabrication of a novel Mo_2C-C hetero-matrix with a moderate thickness of protective carbon layer and intrinsic high conductive Mo_2C nanoparticles incorporation, the volume expansion and pulverization of the electrode materials could be strongly alleviated, the ion and electron transport could be well facilitated. The novel strategy provides a new way to improve the electrochemical performance of electrode materials in energy storage system.