Accepted Manuscript

Title: Vertical crosslinking MoS_2/three-dimensional graphene composite towards high performance supercapacitor

Authors: Chengjie Han, Zhen Tian, Huanglin Dou, Xiaomin Wang, Xiaowei Yang

PII: S1001-8417(18)30026-3
DOI: https://doi.org/10.1016/j.cclet.2018.01.017
Reference: CCLET 4407

To appear in: *Chinese Chemical Letters*

Please cite this article as: Chengjie Han, Zhen Tian, Huanglin Dou, Xiaomin Wang, Xiaowei Yang, Vertical crosslinking MoS2/three-dimensional graphene composite towards high performance supercapacitor, Chinese Chemical Letters https://doi.org/10.1016/j.cclet.2018.01.017

Communication

Vertical crosslinking MoS_2/three-dimensional graphene composite towards high performance supercapacitor

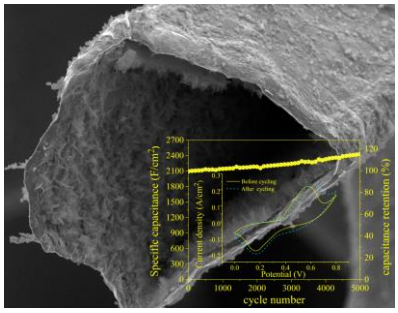
Chengjie Han[a], Zhen Tian[a], Huanglin Dou[a], Xiaomin Wang[a,*],Xiaowei Yang[b,*]

[a] *College of Materials Science and Engineering, Taiyuan University of Technology, Taiyuan 030024, China*
[b] *Research Institute of Tsinghua University in Shenzhen, Shenzhen 518057, China*

∗ Corresponding authors.
E-mail addresses: wangxiaomin@tyut.edu.cn (X. Wang), yang-xw@163.com (X. Yang).

ARTICLE INFO
Article history:
Received
Received in revised form
Accepted
Available online

Graphical Abstract



The vertical crosslinking MoS_2/three-dimensional graphene composite has been prepared by hydrothermal method, which delivered a superior and stable electrochemical capacitive performance.

ABSTRACT
Molybdenum disulfide (MoS_2) has been stimulated in extensive researches due to its layered structure and the potential as an electrochemical energy material. However, the effects on electrochemical performance of concentration of MoS_2 are rarely mentioned. In this paper, the effects of different concentrated layered MoS_2 on the morphology and electrochemical properties of the composite of MoS_2 and three-dimensional graphene (MoS_2/3DG) were discussed. The results show that layered MoS_2 was successfully compounded to 3DG and formed a vertical crosslinking structure. It can be observed that MoS_2 nanosheets are vertically loaded on the inner and outer surface of graphene when the concentration of MoS_2 is 0.20 mg/L. The specific capacitance of composite (MoS_2 (0.20 mg/L)/3DG) reaches 2182.33 mF/cm^2 at the current density of 1 mA/cm^2, and the specific capacitance remains 116.83% after 5,000 cycles. When the current density increased 100 times (from 1 mA/cm^2 to 100 mA/cm^2), the specific capacitance retains 78.9%. Meanwhile, the hybrid energy storage devises can deliver an energy density of 130.34 Wh/m^2. The superior electrochemical properties are attributed to the synergistic effect of MoS_2 and 3DG. Therefore, the material has a potential application on supercapacitor electrode material.

Keywords:
MoS_2
Three-dimensional graphene
Supercapacitor
Vertical crosslinking
Energy storage

Transitional metal dichalcogenides with layered structure, such as tungsten sulfide (WS_2) and molybdenum disulfide (MoS_2), have attracted much attention due to their unique chemical and physical properties. At the same time, MoS_2 has received much