



## Graphical Abstracts/Chin Chem Lett 29 (2018) iii-vii

## Editorial

## Supercapacitors

Chinese Chemical Letters 29 (2018) 551

Zhiqiang Shi<sup>a</sup>, Zhong-Shuai Wu<sup>b</sup>, Zhiqiang Niu<sup>c</sup>, Jinping Liu<sup>d</sup>, Xiaowei Yang<sup>e</sup>, Wei Lv<sup>f</sup><sup>a</sup> Tianjin Polytechnic University, Tianjin 300387, China<sup>b</sup> Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, China<sup>c</sup> Nankai University, Tianjin 300071, China<sup>d</sup> Wuhan University of Technology, Wuhan 430070, China<sup>e</sup> Tongji University, Shanghai 201804, China<sup>f</sup> Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China

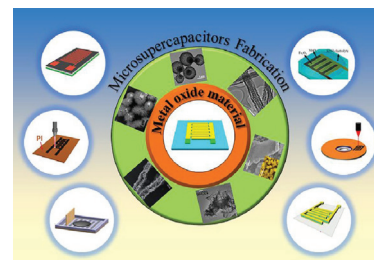
## Reviews

## Recent progress and perspectives of metal oxides based on-chip microsupercapacitors

Chinese Chemical Letters 29 (2018) 553

Tingting Huang<sup>a,b</sup>, Kai Jiang<sup>c</sup>, Di Chen<sup>a</sup>, Guozhen Shen<sup>b</sup><sup>a</sup> College of Physics and Mathematics and Beijing Key Laboratory for Magneto-Photoelectrical Composite and Interface Science, University of Science and Technology Beijing, Beijing 100083, China<sup>b</sup> State Key Laboratory for Superlattices and Microstructures, Institute of Semiconductors, Chinese Academy of Sciences, Beijing 100083, China<sup>c</sup> Institute & Hospital of Hepatobiliary Surgery, Key Laboratory of Digital Hepatobiliary Surgery of Chinese PLA, Chinese PLA Medical School, Chinese PLA General Hospital, Beijing 100853, China

Recent progress on metal oxide nanostructures based on-chip microsupercapacitors was summarized.

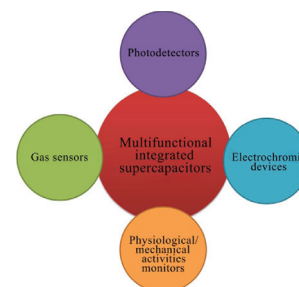


## Recent progress of unconventional and multifunctional integrated supercapacitors

Chinese Chemical Letters 29 (2018) 564

Mengxue Chen<sup>b</sup>, Yun Yang<sup>b</sup>, Dezhi Chen<sup>a</sup>, Hua Wang<sup>b</sup><sup>a</sup> Key Laboratory of Jiangxi Province for Persistent Pollutants Control and Resources Recycle, Nanchang Hangkong University, Nanchang 330063, China<sup>b</sup> School of Chemistry, Beihang University, Beijing 100191, China

We summary the latest works of multifunctional integrated supercapacitors which were combined with photodetectors, gas sensors, electrochromic or physiological/mechanical activities monitors.



## Flexible supercapacitors based on carbon nanotubes

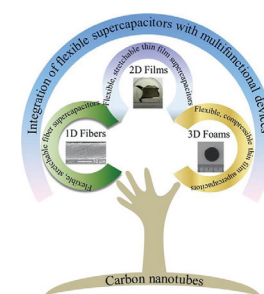
Lili Liu<sup>a</sup>, Zhiqiang Niu<sup>b</sup>, Jun Chen<sup>b</sup>

<sup>a</sup> Tianjin Key Laboratory for Photoelectric Materials and Devices, National Demonstration Center for Experimental Function Materials Education, School of Materials Science and Engineering, Tianjin University of Technology, Tianjin 300384, China

<sup>b</sup> Key Laboratory of Advanced Energy Materials Chemistry (Ministry of Education), College of Chemistry, Nankai University, Tianjin 300071, China

This review provides an overview of recent progress towards the development of flexible supercapacitors based on macroscopic carbon nanotubes-based electrodes, including one-dimensional (1D) fibers, 2D films, and 3D foams, with a focus on electrode preparation and configuration design as well as their integration with other multifunctional devices.

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## Communications

### Simplified fabrication of high areal capacitance all-solid-state micro-supercapacitors based on graphene and MnO<sub>2</sub> nanosheets

Jieqiong Qin<sup>a,c</sup>, Zhong-Shuai Wu<sup>a</sup>, Feng Zhou<sup>a</sup>, Yanfeng Dong<sup>a</sup>, Han Xiao<sup>a</sup>, Shuanghao Zheng<sup>a,b,c</sup>, Sen Wang<sup>a,c</sup>, Xiaoyu Shi<sup>a,b,d</sup>, Haibo Huang<sup>a</sup>, Chenglin Sun<sup>a</sup>, Xinhe Bao<sup>a,b</sup>

<sup>a</sup> Dalian National Laboratory for Clean Energy, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, China

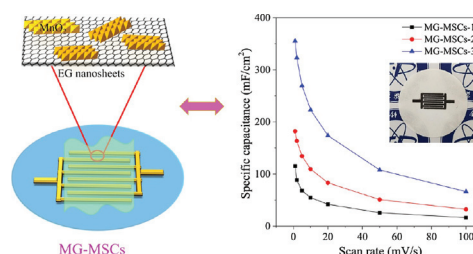
<sup>b</sup> State Key Laboratory of Catalysis, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, China

<sup>c</sup> University of Chinese Academy of Sciences, Beijing 100049, China

<sup>d</sup> Department of Chemical Physics, University of Science and Technology of China, Hefei 230026, China

A universal simplified strategy was developed to fabricate all-solid-state planar micro-supercapacitors with high areal capacitance (~355 mF/cm<sup>2</sup>), based on interdigital patterned films of 2D pseudocapacitive MnO<sub>2</sub> nanosheets and electrochemically exfoliated graphene.

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### Paper-based all-solid-state flexible asymmetric micro-supercapacitors fabricated by a simple pencil drawing methodology

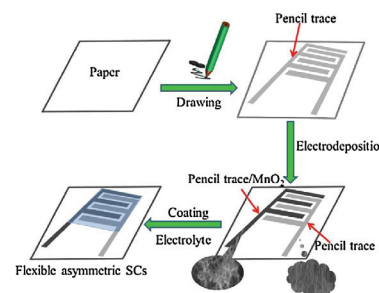
Lanqian Yao<sup>a</sup>, Tao Cheng<sup>a</sup>, Xiaoqin Shen<sup>a</sup>, Yizhou Zhang<sup>a</sup>, Wenyong Lai<sup>a</sup>, Wei Huang<sup>a,b</sup>

<sup>a</sup> Key Laboratory for Organic Electronics and Information Displays (KLOEID), Institute of Advanced Materials (IAM), Jiangsu National Synergetic Innovation Center for Advanced Materials (SICAM), Nanjing University of Posts & Telecommunications, Nanjing 210023, China

<sup>b</sup> Shaanxi Institute of Flexible Electronics (SIFE), Northwestern Polytechnical University (NPU), Xi'an 710072, China

A simple and novel methodology was developed for manufacturing interdigitated asymmetric all-solid-state flexible micro-supercapacitors (MSCs) by a facile pencil drawing process followed by electrodepositing MnO<sub>2</sub> on one of the as-drawn graphite electrode as anode and the other as cathode.

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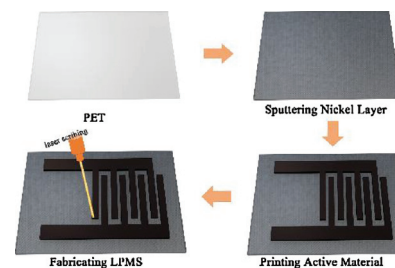
### Laser processed micro-supercapacitors based on carbon nanotubes/manganese dioxide nanosheets composite with excellent electrochemical performance and aesthetic property

Lu Shi, Yang Wang, Peichao Zou, Xuanyu Wang, Dang Wu, Ronghe Wang, Cheng Yang

Division of Energy and Environment, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China

A laser processed micro-supercapacitor (LPMS) based on carbon nanotubes/manganese dioxide composite is fabricated through slurry dispensing and laser scribing techniques. This device presents superior electrochemical performance and aesthetic property.

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## All-solid-state pseudocapacitive micro-supercapacitors from laser-treated polymer derivatives

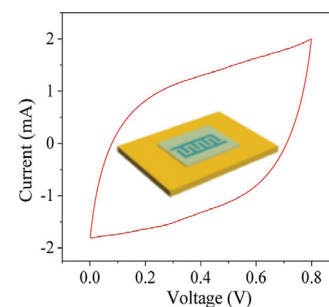
Zhi Huang<sup>b</sup>, Bo Yuan<sup>a</sup>

<sup>a</sup> College of Power Engineering, Chongqing University, Chongqing 400044, China

<sup>b</sup> School of Energy & Environmental Engineering, University of Science & Technology Beijing, Beijing 400044, China

A simple method utilizing laser writing technology to fabricate all-solid-state micro-supercapacitors was reported. The solid-state micro-supercapacitors based on MnO<sub>2</sub>/graphene nanocomposites deliver high volumetric capacitances, promising energy density, good stability and low leakage current.

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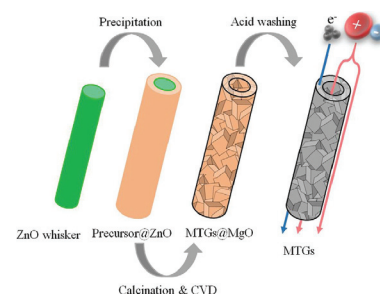
## Mesoporous tubular graphene electrode for high performance supercapacitor

Jiarui Tian, Chaojie Cui, Chao Zheng, Weizhong Qian

Department of Chemical Engineering, Tsinghua University, Beijing 100084, China

Mesoporous tubular graphene, synthesized by template method, have unique bi-directional ions transfer channel in unstack graphene layers and high mesopore ratio, exhibiting excellent capacitance performance in the EDLC using ionic liquid electrolyte at 4 V.

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## “Soft” graphene oxide-organopolysulfide nanocomposites for superior pseudocapacitive lithium storage

Yang Li<sup>a</sup>, Qingcong Zeng<sup>a,b</sup>, Ian R. Gentle<sup>a</sup>, Da-Wei Wang<sup>a,b</sup>

<sup>a</sup> School of Chemistry and Molecular Biosciences, The University of Queensland, Brisbane, QLD 4072, Australia

<sup>b</sup> School of Chemical Engineering, The University of New South Wales, NSW 2052, Australia

We report a “soft” graphene oxide-organopolysulfide nanocomposite with improved pseudocapacitive performance for high-potential (1–2.8 V vs. Li<sup>0</sup>/Li<sup>+</sup>), high-capacity (278 mAh/g) and stable (500 cycles) lithium storage.

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## Vertical crosslinking MoS<sub>2</sub>/three-dimensional graphene composite towards high performance supercapacitor

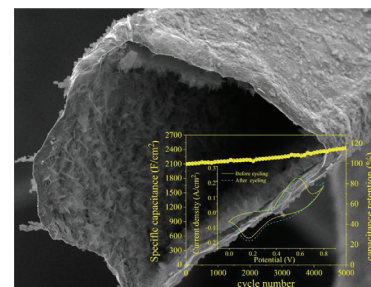
Chengjie Han<sup>a</sup>, Zhen Tian<sup>a</sup>, Huanglin Dou<sup>a</sup>, Xiaomin Wang<sup>a</sup>, Xiaowei Yang<sup>b</sup>

<sup>a</sup> College of Materials Science and Engineering, Taiyuan University of Technology, Taiyuan 030024, China

<sup>b</sup> Research Institute of Tsinghua University in Shenzhen, Shenzhen 518057, China

The vertical crosslinking MoS<sub>2</sub>/three-dimensional graphene composite has been prepared by hydrothermal method, which delivered a superior and stable electrochemical capacitive performance.

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## Hollow $\text{Co}_9\text{S}_8$ from metal organic framework supported on rGO as electrode material for highly stable supercapacitors

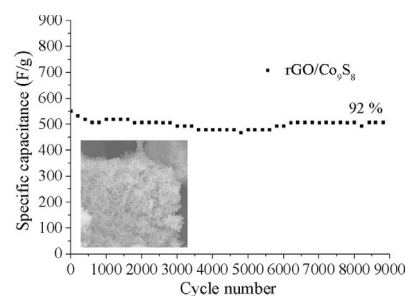
Peng Wang<sup>a,b</sup>, Chunyang Li<sup>b</sup>, Weigang Wang<sup>b</sup>, Jing Wang<sup>b</sup>, Yusong Zhu<sup>b</sup>, Yuping Wu<sup>a,b</sup>

<sup>a</sup> State Key Laboratory of Materials-Oriented Chemical Engineering, Nanjing Tech University, Nanjing 211816, China

<sup>b</sup> School of Energy Science and Engineering & Institute for Advanced Materials, Nanjing Tech University, Nanjing 211816, China

We demonstrate a hydrothermal method to fabricate a composite of reduced graphene oxide (rGO) with hollow  $\text{Co}_9\text{S}_8$  derived from metal organic framework (MOF), which exhibits a high specific capacitance of 575.9 F/g at 2 A/g and 92.0% capacitance retention after 9000 cycles.

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## Flexible asymmetric supercapacitor based on $\text{MnO}_2$ honeycomb structure

Yuling Chen<sup>a</sup>, Chao Chen<sup>b</sup>, Ruitao Lv<sup>b</sup>, Wanci Shen<sup>b</sup>, Feiyu Kang<sup>b</sup>, Nyanhwa Tai<sup>c</sup>, Zhenghong Huang<sup>a,b</sup>

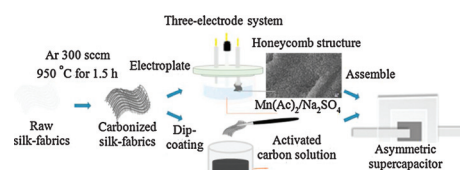
<sup>a</sup> State Key Laboratory of New Ceramics and Fine Processing, School of Materials Science and Engineering, Tsinghua University, Beijing 100084, China

<sup>b</sup> Key Laboratory of Advanced Materials (MOE), School of Materials Science and Engineering, Tsinghua University, Beijing 100084, China

<sup>c</sup> Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu 30013, China

By controlling the electroplating time of solution containing  $\text{Mn}(\text{Ac})_2$ , the  $\text{MnO}_2$  nanosheets were self-assembled to the honeycomb structure and showed an excellent electrochemical performance in 1 mol/L  $\text{Na}_2\text{SO}_4$  electrolyte. Via pairing with activated carbon as negative electrode, the capacitor could deliver a maximum energy density of 43.84 Wh/kg and a maximum power density of 6.62 kW/kg.

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## Mesoporous carbon material as cathode for high performance lithium-ion capacitor

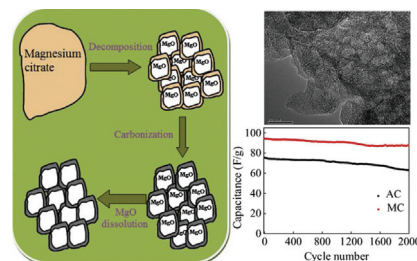
Jin Zhang<sup>a</sup>, Jing Wang<sup>a</sup>, Zhiqiang Shi<sup>a</sup>, Zhiwei Xu<sup>b</sup>

<sup>a</sup> Tianjin Key Laboratory of Advanced Fiber and Energy Storage, College of Materials Science and Engineering, Tianjin Polytechnic University, Tianjin 300387, China

<sup>b</sup> Key Laboratory of Advanced Braided Composites, Ministry of Education, School of Textiles, Tianjin Polytechnic University, Tianjin 300387, China

The mesoporous carbon material with large pore volume and high surface area by a simple *situ* MgO template method is synthesized, which is utilized as cathode to assemble a high performance lithium ion capacitor.

Chinese Chemical Letters 29 (2018) 620



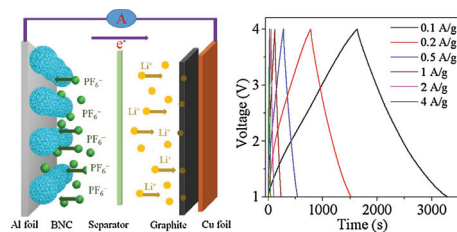
## Boron and nitrogen dual-doped carbon as a novel cathode for high performance hybrid ion capacitors

Jiangmin Jiang, Ping Nie, Shan Fang, Yadi Zhang, Yufeng An, Ruirui Fu, Hui Dou, Xiaogang Zhang

Jiangsu Key Laboratory of Materials and Technology for Energy Conversion, College of Material Science and Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China

A high performance hybrid ion capacitors has been developed by using B, N dual-doped 3D superstructure carbon cathode and prelithiated graphite anode.

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## Bismuth oxide nanoflake@carbon film: A free-standing battery-type electrode for aqueous sodium ion hybrid supercapacitors

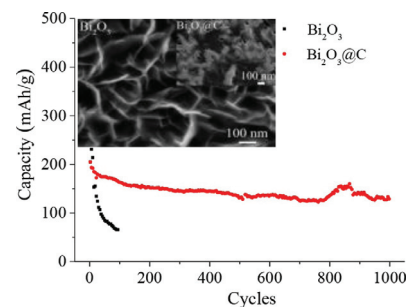
Zhenshuai Zhao<sup>a</sup>, Yihua Ye<sup>a</sup>, Weihua Zhu<sup>a</sup>, Liang Xiao<sup>a</sup>, Bohua Deng<sup>a</sup>, Jinping Liu<sup>a,b</sup>

<sup>a</sup> School of Chemistry, Chemical Engineering and Life Science, Wuhan University of Technology, Wuhan 430070, China

<sup>b</sup> State Key Laboratory of Advanced Technology for Materials Synthesis and Processing, Wuhan University of Technology, Wuhan 430070, China

An efficient strategy is developed to fabricate binder-free Bi<sub>2</sub>O<sub>3</sub>@C nanoflake film anode, which is utilized to assemble a high-performance aqueous sodium ion hybrid supercapacitor.

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## High-performance organic electrolyte supercapacitors based on intrinsically powdery carbon aerogels

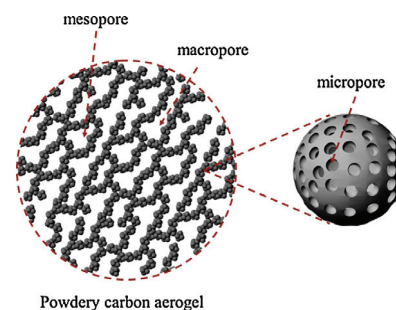
Xidong Lin<sup>a</sup>, He Lou<sup>a</sup>, Wenrui Lu<sup>a</sup>, Fei Xu<sup>b</sup>, Ruowen Fu<sup>a</sup>, Dingcai Wu<sup>a</sup>

<sup>a</sup> Materials Science Institute, PCFM Lab and GDHPRC Lab, School of Chemistry, Sun Yat-sen University, Guangzhou 510275, China

<sup>b</sup> Center for Nano Energy Materials, State Key Laboratory of Solidification Processing, School of Materials Science and Engineering, Northwestern Polytechnical University and Shaanxi Joint Laboratory of Graphene (NPU), Xi'an 710072, China

Powdery carbon aerogel with an ideal hierarchical pore structure shows impressive capacitive performances when utilized as electrodes for organic electrolyte supercapacitors.

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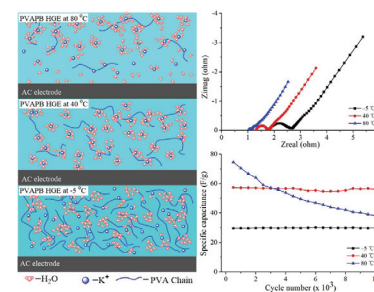
## Temperature stability of symmetric activated carbon supercapacitors assembled with *in situ* electrodeposited poly(vinyl alcohol) potassium borate hydrogel electrolyte

Wanwan Lv, Runping Xue, Sheng Chen, Mengjin Jiang

College of Polymer Science and Engineering, Sichuan University, Chengdu 610065, China

Temperature stability of symmetric activated carbon (AC) supercapacitors (SCs) assembled with *in situ* electrodeposited poly(vinyl alcohol) potassium borate hydrogel electrolyte was systematically studied and compared with that of AC SCs assembled with liquid aqueous electrolytes in the temperature range from -5 °C to 80 °C.

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## Natural nanomaterial as hard template for scalable synthesizing holey carbon nanosheet/nanotube with in-plane and out-of-plane pores for electrochemical energy storage

Yijie Zhang<sup>a</sup>, Luhua Lu<sup>a,b</sup>, Zhao Zhang<sup>a</sup>, Zhu Shu<sup>a,b</sup>, Kai Dai<sup>c</sup>, Jinghai Liu<sup>d</sup>, Ying Chen<sup>a,b</sup>, Hongyun Jin<sup>a</sup>, Shuen Hou<sup>a</sup>

<sup>a</sup> China University of Geosciences Wuhan, Wuhan 430074, China

<sup>b</sup> Zhejiang Institute, China University of Geosciences, Hangzhou 311305, China

<sup>c</sup> College of Physics and Electronic Information, Huaibei Normal University, Huaibei 235000, China

<sup>d</sup> Chemistry and Chemical Engineering, Inner Mongolia University for the Nationalities, Tongliao 028000, China

By tuning the structure of hard template kaolinite, we have achieved a template directed synthesis of holey carbon nanosheet/nanotube material. This carbon nanomaterial with in-plane and out-of-plane pores has shown promising electrochemical energy storage capacity.

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