Curriculum Vitae

Xu XIAO

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Education Background

Huazhong University of Science and Technology **2007.09-2011.07**

- Bachelor, School of Physics

Huazhong University of Science and Technology **2011.07-2016. 06**

- Ph.D., School of Optical and Electronic Information, Wuhan National Laboratory for Optoelectronics
  Supervisor: Prof. Jun Zhou
- Visiting student, Drexel University, Supervisor: Prof. Yury Gogotsi (2013)

Drexel University **2016.12-now**

- Postdoctoral researcher, Supervisor: Prof. Yury Gogotsi. Research on new 2D metal nitrides and carbides.

Research Experience

Regulation of the electron/ion transport of metal oxide for energy storage

The main issue of metal oxide is the poor electron conductivity and ion diffusion which largely hinder the performance. The carrier of n-type metal oxide is electron. I thought if I can tune the carrier density, the electron conductivity would be enhanced radically. By use of in-situ doping and hydrogenation, we could control and introduce oxygen vacancies in the oxide and largely improve the electron conductivity. Largely enhanced electrochemical performances were achieved after these regulations. I also systematically study the influence of surface functional group on electron/ion conductivity and tune the ratio of different groups to obtain the highest performance.

Besides, the energy storage mechanism of some oxide (for example, MoO_3) is intercalation, ions must be stored in the interlayer of oxide. Considering that the interlayer distance of oxide is not large enough, I developed a method to pre-inserted K^+ in the interlayer of MoO_3, which increased the distance of interlayer and solve the ion transport issue. Interestingly, such an interlayer-enhanced material could be directly used in large ions electrolyte-even sea water (the first report in literature).

Development of a scalable and general method for two-dimensional metal oxides, metal nitrides and metal carbides (even nonlayered structure)

If all of the active atoms could be exposed to the electrolyte, the ion transport issue could be thoroughly solved. In this way, I developed a scalable and general method to obtain high quality and large size (100 μm) 2D oxide even with nonlayered structure (such as *h*-MoO_3, *h*-WO_3, MoO_2 and MnO), which solves the disadvantages of both vacuum (CVD, high quality but low amount) and solution (large amount but sometimes low quality and need surfactant) method. Using 2D *h*-MoO_3 as the example, we could achieve the theoretical capacitance (996 C/g) at a high sweep rate which means very fast ions transport speed. Interestingly, we found that 2D *h*-MoO_3 showed a unique property in Al-electrolyte with the largest volumetric capacitance (300 F/cm^3) compared to literature, indicating the potential in Al-ions battery.

Development of self-powered systems

I have developed a high mass-loading freestanding electrode and fabricated the flexible solid-state SCs. Combined with solar cells and triboelectric generators, we could collect the micro energy from environment and store into flexible

solid-state SCs to drive electronic devices, resulting in a self-powered system.

Research on nanosensors

Fabrication of a semi-transparent high-strain sensor based on ZnO/polymer hybrid film, which can measure and withstand strain up to 50%.

Honors

- Outstanding graduate of Huazhong University of Science and Technology **2016**
- Graduate representative of Huazhong University of Science and Technology **2016**
- National Scholarship **2014**
- "Top Ten Graduate in Science" of Huazhong University of Science and Technology **2013**
- "Best Student Paper Award" of The 6th International Photonics and OptoElectronics Meetings **2013**
- National Scholarship **2012**
- "Three Goods" graduate of Huazhong University of Science and Technology **2012**

Publications

Cited times: **2721**, h-index: 18. Google scholar: https://scholar.google.com.hk/citations?user=neE3h2QAAAAJ&hl=en

1. **Xiao, X.**; Yu, H.; Jin, H.; Wu, M.; Fang, Y.; Sun, J.; Hu, Z.; Li, T.; Wu, J.; Huang, L.; Gogotsi, Y.; Zhou, J. Salt-templated Synthesis of 2D Metallic MoN and Other Nitrides, ***ACS Nano***, **2017**, 11, 2180. (cited times: 2)
2. **Xiao, X.**; Song, H.; Lin, S.; Zhou, Y.; Zhan, X.; Hu, Z.; Zhang, Q.; Sun, J.; Yang, B.; Li, T.; Jiao, L.; Zhou, J.; Tang, J.; Gogotsi, Y. Scalable Salt-Templated Synthesis of 2D Transition Metal Oxides. ***Nat. Commun.***, **2016**, 7, 11296. (cited times: 27, **reports and mentions by 23 news articles, such as Materials Today, Nanowerk, Science Daily, Yahoo…**)
3. Hu, Z. †; **Xiao, X.** †; Jin, H.†; Li, T.; Chen M.; Liang Z.; Guo Z.; Li J.; Wan J.; Huang L.; Zhang Y.; Feng G.; Zhou J. Rapid mass production of two-dimensional metal oxides and hydroxides via the molten salts method. ***Nat. Commun.***, **2017**, just accepted. (**co-first author**)
4. **Xiao, X.**; Yuan, L.; Zhong, J.; Ding, T.; Liu, Y.; Cai, Z.; Rong, Y.; Han, H.; Zhou, J.; Wang, Z. L., High-Strain Sensors Based on ZnO Nanowire/Polystyrene Hybridized Flexible Films. ***Adv. Mater.*** **2011**, *23*, 5440-5444. (cited times: 185, **ESI highly cited paper**)
5. **Xiao, X.**; Peng, X.; Jin, H.; Li, T.; Zhang, C.; Gao, B.; Yuan, L.; Hu, B.; Huo, K.; Zhou, J., Freestanding mesoporous VN/CNT hybrid electrodes for flexible all-solid-state supercapacitors. ***Adv. Mater.*** **2013**, *25*, 5091-5097. (cited times: 171, **ESI highly cited paper**)
6. Yuan, L.†; **Xiao, X.**†; Ding, T.; Zhong, J.; Zhang, X.; Shen, Y.; Hu, B.; Huang, Y.; Zhou, J.; Wang, Z. L., Paper-based supercapacitors for self-powered nanosystems. ***Angew. Chem. Int. Ed.*** **2012**, *51*, 4934-4938. (**co-first author**) (cited times: 231, **ESI highly cited paper**)
7. **Xiao, X.**; Ding, T.; Yuan, L.; Shen, Y.; Zhong, Q.; Zhang, X.; Cao, Y.; Hu, B.; Zhai, T.; Gong, L.; Chen, J.; Tong, Y.; Zhou, J.; Wang, Z. L., WO_{3-x}/MoO_{3-x} Core/Shell Nanowires on Carbon Fabric as an Anode for All-Solid-State Asymmetric Supercapacitors. ***Adv. Energy Mater.*** **2012**, *2*, 1328-1332. (cited times: 193, **ESI highly cited paper**)
8. **Xiao, X.**; Li, T.; Yang, P.; Gao, Y.; Jin, H.; Ni, W.; Zhan, W.; Zhang, X.; Cao, Y.; Zhong, J.; Gong, L.; Yen, W.-C.; Mai, W.; Chen, J.; Huo, K.; Chueh, Y.-L.; Wang, Z. L.; Zhou, J., Fiber Based All-Solid-State Flexible Supercapacitors for Self-Powered Systems. ***ACS Nano*** **2012**, *6*, 9200-9206. (cited times: 282, **ESI highly cited paper**)
9. **Xiao, X.**; Li, T.; Peng, Z.; Jin, H.; Zhong, Q.; Hu, Q.; Yao, B.; Luo, Q.; Zhang, C.; Gong, L.; Chen, J.; Gogotsi, Y.; Zhou, J., Freestanding functionalized carbon nanotube-based electrode for solid-state asymmetric supercapacitors. ***Nano Energy*** **2013**, 6, 1-9. (cited times: 90, **ESI highly cited paper, reported by Materials Today**)
10. **Xiao**, **X.**; Peng, Z.; Chen, C.; Zhang, C.; Beidaghi, M.; Yang, Z.; Wu, N.; Huang, Y.; Miao, L.; Gogotsi, Y.; Zhou, J.,

Freestanding MoO_{3-x} nanobelt/carbon nanotube films for Li-ion intercalation pseudocapacitors. ***Nano Energy*** **2014**, 9, 355-363. (cited times: 46)

11. **Xiao, X.**; Zhang, C.; Lin, S.; Huang, L.; Hu, Z.; Cheng, Y.; Li, T.; Qiao, W.; Long, D.; Huang, Y.; Mai, L.; Gogotsi, Y.; Zhou, J., Intercalation of cations into partially reduced molybdenum oxide for high-rate pseudocapacitors. ***Energy Storage Mater.*** **2015**, *1*, 1-8. (cited times: 26)
12. Xu, D. F.†; **Xiao, X.**†; Cai, J.; Zhou, J.; Zhang, L. N., Highly rate and cycling stable electrode materials constructed from polyaniline/cellulose nanoporous microspheres. ***J. Mater. Chem. A*** 2015, 3, 16424-16429. (**co-first author,** cited time: 10)
13. Zhang, Q.†; **Xiao, X.**†; Zhao, R.; Lv, D.; Xu, G.; Lu, Z.; Sun, L.; Lin, S.; Gao, X.; Zhou, J.; Jin, C.; Ding, F.; Jiao, L., Two-Dimensional Layered Heterostructures Synthesized from Core-Shell Nanowires. ***Angew. Chem. Int. Ed.*** 2015, *54*, 8957-8960. (**co-first author**) (cited times: 17)
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17. Yang, P., **Xiao, X.**, Li, Y., Ding, Y., Qiang, P., Tan, X., Mai, W., Lin, Z., Wu, W., Li, T., Jin. H., Liu, P., Zhou, J., Wong, C. P., Wang, Z. L., Hydrogenated ZnO Core-Shell Nanocables for Flexible Supercapacitors and Self-Powered Systems. ***ACS Nano*** **2013**, *7*, 2617-2626. (cited times: 413, **ESI highly cited paper**)
18. Yao, B.; Yuan, L.; **Xiao, X.**; Zhang, J.; Qi, Y.; Zhou, J.; Zhou, J.; Hu, B.; Chen, W.; Paper-based solid-state supercapacitors with pencil-drawing graphite/polyaniline networks hybrid electrodes. ***Nano Energy*** **2013**, *2*, 1071-1078. (cited times: 99)
19. Hu, Z.; **Xiao**, **X.**; Chen, C.; Li, T.; Huang, L.; Zhang, C.; Su, J.; Miao, L.; Jiang, J.; Zhang, Y.; Zhou, J.; Al-doped α-MnO_2 for high mass-loading pseudocapacitor with excellent cycling stability. ***Nano Energy*** **2015**, *11*,226-234. (cited times: 46)
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30. Cheng Y.; Huang L.; **Xiao X.**; Yao B.; Hu Z.; Li T.; Liu K.; Zhou J., Cross-linked carbon network with hierarchical porous structure for high performance solid-state electrochemical capacitor. ***J. Power Source*** **2016**, 327, 488-494. (cited times: 2)