

Hybrid organic/inorganic chalcogenides based conductive materials: synthesis, characterizations and performances

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Hybrid organic/inorganic chalcogenides refer to materials constructed with organic ligands bearing thiol (or selenol) units and metal ions, in which continuous 1D, 2D or 3D M-X (M: metal ions, X: S or Se) chains or networks are formed. M-X chains and networks provide the path for efficient charge transport, organic subunits provide the potential for tuning the electronic structure and corresponding electrical performance, and all these factors make hybrid organic/inorganic chalcogenides find applications in energy conversion and storage, electrocatalysts, chemiresistive sensors and so on. Besides these practical applications, conductive CPs display fascinating features in more fundamental areas, such as spintronics, superconductors, quantum materials, and topological insulators.

Recently, we have constructed a series of hybrid organic/inorganic chalcogenides based on benzenhexathiol (BHT) and its analogues. Besides the developing of synthesis method, structure characterization, their potentials as thermoelectric materials, electrocatalysts and electrode materials for supercapacitors have been explored. Superconductivity was also found in one of the most conductive materials Cu₃BHT.

References

- [1] X. Huang, P. Sheng, Z. Tu, F. Zhang, J. Wang, H. Geng, Y. Zou, C. Di, Y. Yi, Y. Sun, W. Xu and D. Zhu, Nat. Commun. 2015, 6, 7408.
- [2] Xing Huang, Shuai Zhang, Liyao Liu, Lei Yu, Genfu Chen, Wei Xu, and Daoben Zhu, Angew. Chem. Int. Ed. 2018, 57, 146–150.
- [3] Xing Huang, Haisheng Li, Zeyi Tu, Liyao Liu, Xiaoyu Wu, Jie Chen, Yingying Liang, Ye Zou, Yuanping Yi, Junliang Sun, Wei Xu, and Daoben Zhu, J. Am. Chem. Soc. 2018, 140, 15153–15156.
- [4] Yutao Cui, Jie Yan, Zhijun Chen, Jiajia Zhang, Ye Zou, Yimeng Sun, Wei Xu, and Daoben Zhu, Adv. Sci. 2019, 6, 1802235
- [5] T. Takenaka, K. Ishihara, M. Roppongi, Y. Miao, Y. Mizukami, T. Makita, J. Tsurumi, S. Watanabe, J. Takeya, M. Yamashita, K. Torizuka, Y. Uwatoko, T. Sasaki, X. Huang, W. Xu, D. Zhu, N. Su, J.-G. Cheng, T. Shibauchi, K. Hashimoto, Sci. Adv. 2021; 7 : eabf3996.