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• EDITORIAL •
• SPECIAL TOPIC • Advances in Organic Optoelectronic Molecules & Materials

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Preface

Organic molecular materials and devices are one of the most important research areas of chemistry in the 21st century and thus have received extensive attentions. Basically, organic functional molecules based on π-conjugated systems can be easily modified to tune multi-level self-assembled structures with optimized optical and electronic properties via rational molecular design. Such features make them promising candidates for many applications. The chemistry and material society have witnessed the remarkable progress in the development of new organic semiconductors with high mobilities, organic photovoltaic materials, organic electroluminescent materials, molecular switches and so on. From the view of device fabrication process, small molecular functional materials possess advantages of high purity and low processing cost. Markedly, Chinese scientists have played an important role in prompting the research work in these topics.

In the spring of 2014, the National Natural Science Foundation of China has organized a symposium on organic optoelectronic molecules and devices. About 30 invited scientists introduced their contributions and discussed the perspective of main sub-fields, including molecular design and synthesis, assembly and regulation, functionalization and fabrication. Based on the importance of organic optoelectronics and that symposium, we organized this special topic for *Sci. China Chem.* to array recent research progress, mainly focusing on the small organic functional molecules. Undoubtedly, the innovation on the small molecular structure and assembly will make a breakthrough in advanced functional materials.

This Special Topic includes 5 review articles. The most highly advanced organic devices are organic light emitting diodes. Xie and Ma *et al*. discussed the progress in the development of small molecule luminescent materials with different design concepts and features, and also briefly predicted the development tendency of luminescent materials. Molecular switch is also emerging as an important application for organic functional molecules. Li and Qu described noticeable achievements over the past decade in this field, and made an overview of the applications of new types of molecular switches. One of the earliest applications of organic optoelectronic devices is in solar cells. In Fan and Zhu's contribution, achievements of small molecules with impressive photovoltaic performance especially reported in the last two years were highlighted. The relationship between molecular structure and device performance was analyzed, which drew some rules for rational molecular design. As the basis for a range of electronic devices, high performance organic transistors require the semiconducting molecules with high carrier mobility. Gao and Zhen outlined more than 50 representative semiconducting molecules and also presented some valuable insights for this important and challenging topic. For organic semiconducting materials, it is possible to tune precisely the frontier molecular orbital energy levels and optical profiles of isolated molecules. However, well-defined macroscopic state, which determines their practical electro-optical properties, is difficult to achieve. In Zheng, Wang and Pei's review, design of suitable organic molecules to form micro-/nanostructures and methods to obtain ideal micro/nanostructures for functional devices were fully discussed. The perspective and opportunity of 1D micro/nanostructured organic materials based OFETs in the near future were also addressed.

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