2P045

Conductive Polymer Modified Covalent Organic Framework

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[Abstract]

A conductive polymer modified covalent organic framework (COF) was prepared by polymerization of conductive polymer inside the nanochannels of COF. The resulting composite showed an increment of the bulk electrical conductivity. The increase in conductivity could be attributed to the formation of highly oriented and conducting polymer chains inside 1D nanochannels of COF.

[Introduction]

Covalent organic frameworks (COFs) are a class of highly designable and functionalizable crystalline porous organic materials. COFs are composed of light-weight elements by strong covalent bonds. COFs can be obtained smoothly through a template-free chemical process by selection of proper building blocks and polymerization reactions, which show efficient preparation and high flexibility in the molecular design. COFs have exhibited potential applications in heterogeneous catalysis, gas storage, gas separation and energy storage. [1,2] By introducing redox active sites into the COFs, COF-based supercapacitors shown their promising potential in high energy storage. However, the insulating nature of the COFs has limited the electrochemical performance. Preparation of electrically conductive COFs is a big challenge. To obtain conductive COFs, one strategy is to introduce conductive polymers into the pores of COFs by polymerization inside the nano-channels of covalent organic frameworks.

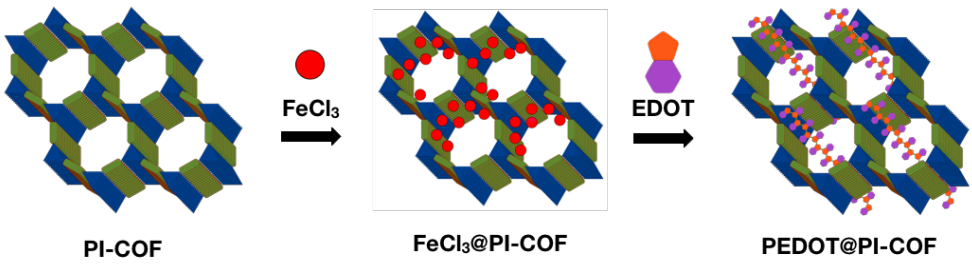

Fig. 1. Synthetic strategy of PEDOT@PI-COF in this research.

[Methods]

The PI-COF was synthesized under typical solvothermal conditions. Conductive PEDOT@PI-COF was prepared in two steps. First, the oxidant (iron(III) chloride, $FeCl_3$) was introduced into the pores of the PI-COF. The second step consisted of absorption of monomers(3,4-Ethylenedioxythiophene, EDOT) into the pores of PI-COF and the polymerization of monomers to form conducting polymer chains.

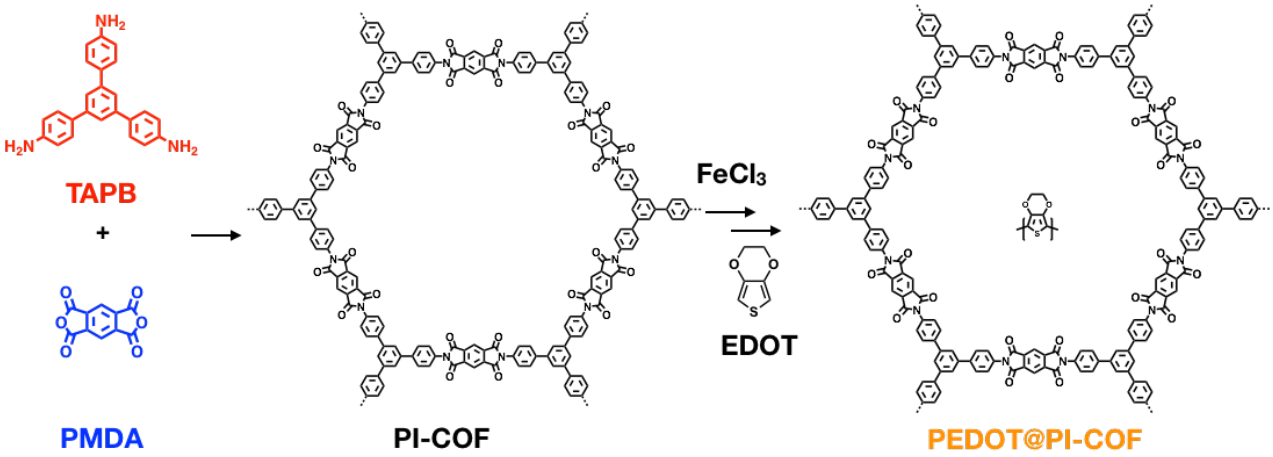

Fig. 2. The synthetic routes for the PI-COF and PEDOT@PI-COF.

[Results and Discussion]

Polymerization of conductive polymer in nanochannels of COFs resulted in an increment of the bulk electrical conductivity. The increase in conductivity was attributed to the formation of highly oriented and conducting polymer chains inside 1D nanochannels.

[References]

[1] Wu, Y., Zhang, Z., Bandow, S., Awaga, K. *Bull. Chem. Soc. Jpn.* **90**, 1382(2017).

[2] Wu, Y., Xu, H., Chen, X., Gao, J., Jiang, D. *Chem. Commun.* **51**, 10096(2015).